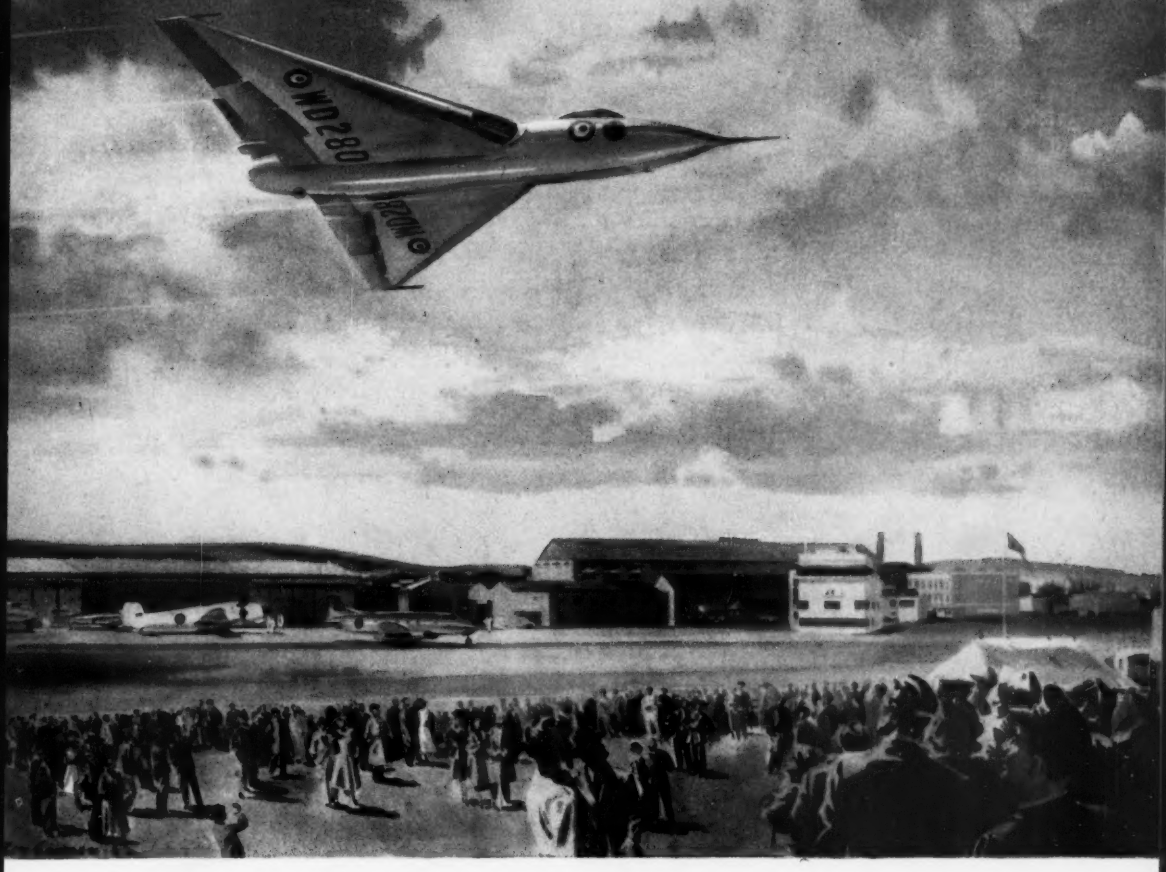
FLIGHT
14 SEPTEMBER 1951 ONE SHILLING

FARNBOROUGH FIRST REPORT

FLIGHT

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB



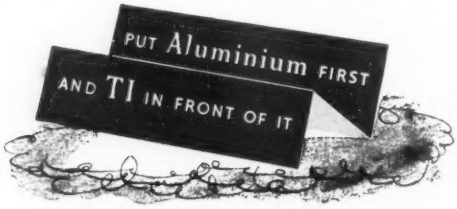
exceeding all expectation . . . .

AVRo

AVRO 707

A V ROE & CO LTD MANCHESTER (Member of the Hawker Siddeley Group)

This headline began as an instruction to our publicity people. There was some sense in it when it started . . . We wanted to show 'no particular aircraft' because T.I. Aluminium alloys, sheet, strip, tubes and extrusions are part and useful parcel of the whole British aircraft industry. T.I. Aluminium materials have proved good enough for the Meteor, Canberra, Shackleton, Vampire, Wyvern, Venom and other famous aircraft. Before even better planes come along, we plan to have even better material for them.



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Hot air control

This reducing valve is one of a series of hot-air controls successfully engineered by Hymatic for jet engines.

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See it at our Stand No. 97 at Farnborough

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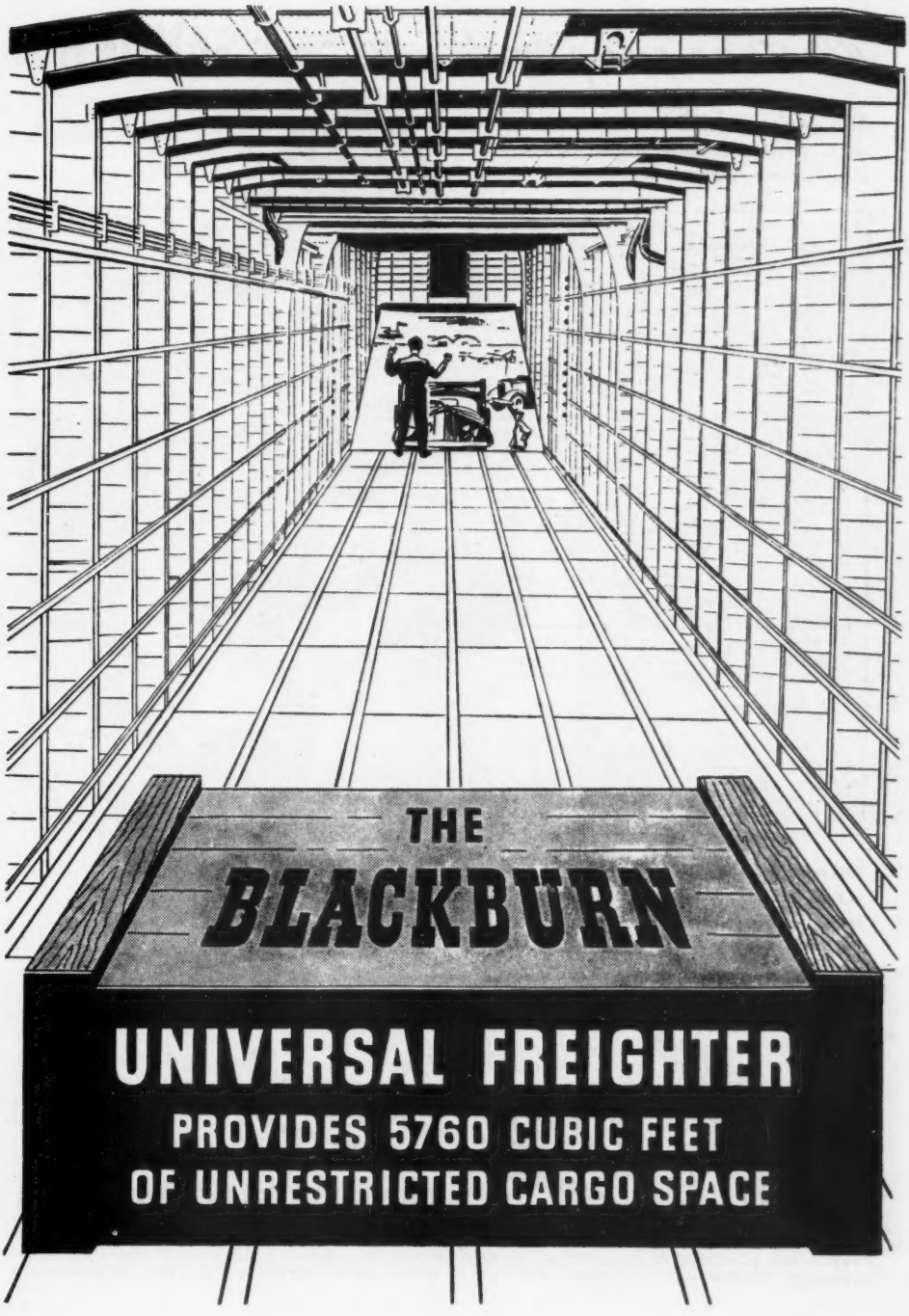
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UNIVERSAL FREIGHTER
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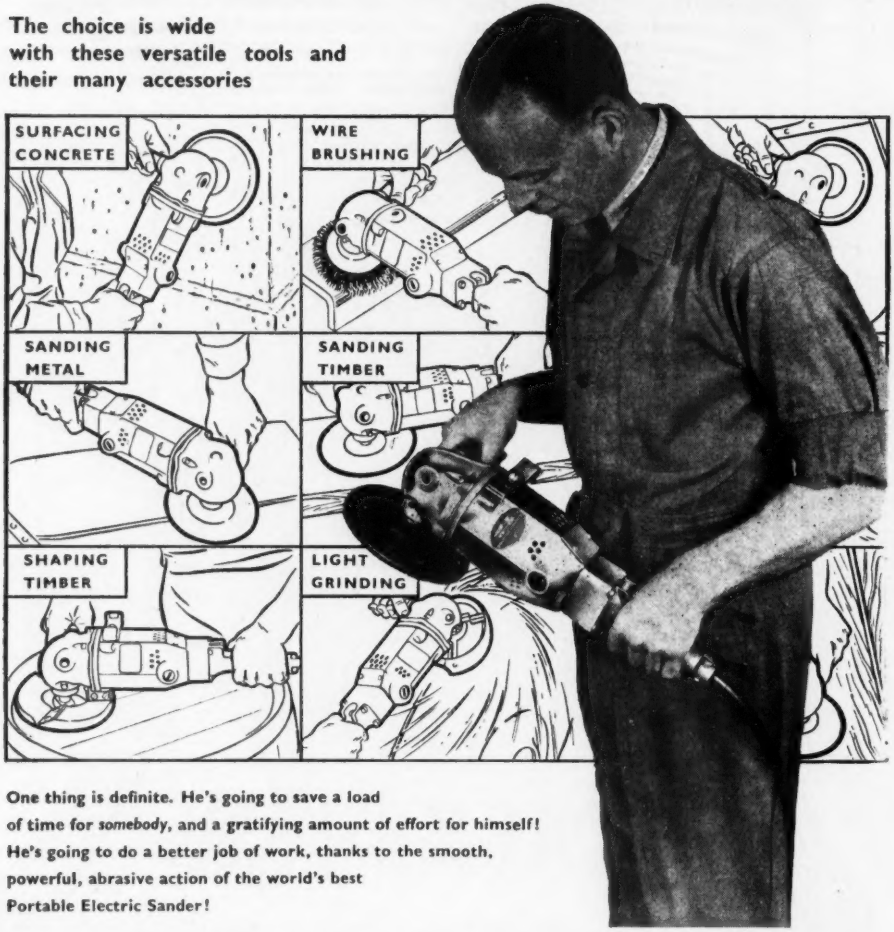
The choice is wide with these versatile tools and their many accessories



One thing is definite. He's going to save a load of time for *somebody*, and a gratifying amount of effort for himself! He's going to do a better job of work, thanks to the smooth, powerful, abrasive action of the world's best Portable Electric Sander!

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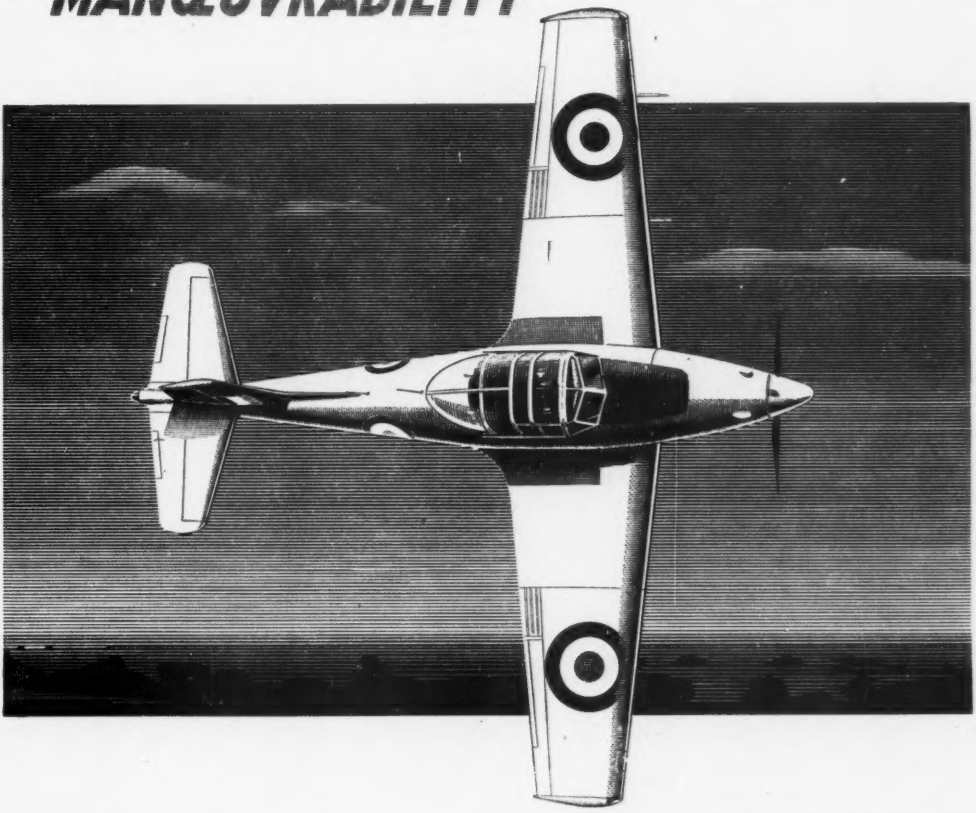
—MANŒUVRABILITY—



FIGHTER-LIKE MANOEUVRABILITY is no idle claim where the Balliol is concerned. At eighty-five per cent of the designed diving speed its rate of roll is 105 degrees per second, and its "feel" and handling qualities are in fact very similar to those of the latest fighters now going into service.

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NEW EYES FOR THE CONVOY

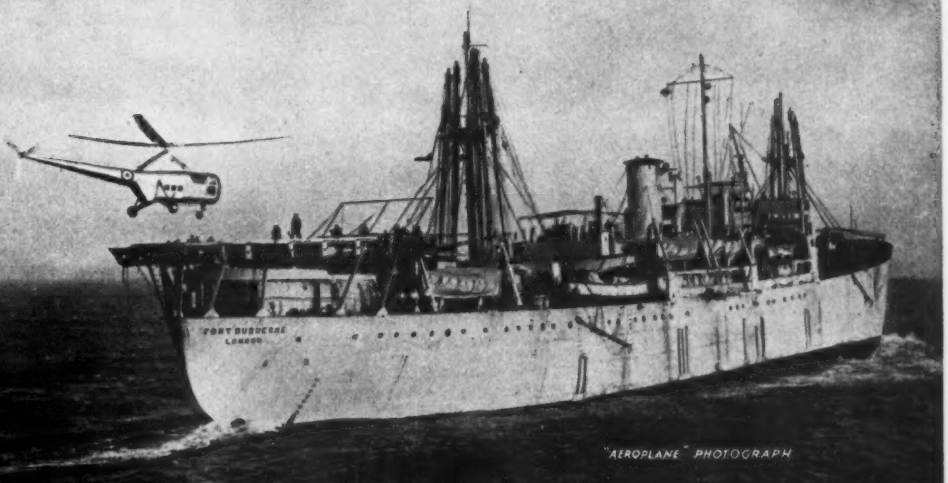
The

WESTLAND

S·51

HELICOPTER

The naval version of the S.51 known as the "Dragonfly" has now been officially adopted by the Royal Navy.



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STRESSED TO MEET NEW REQUIREMENTS OF AFT FACING CONDITIONS

(also fully approved for forward facing if required)

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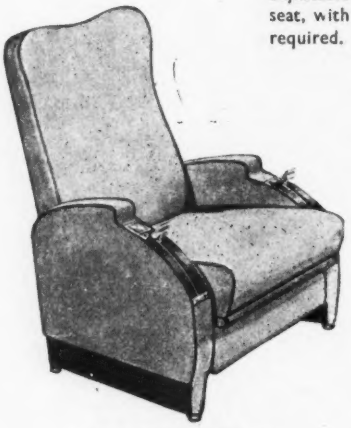
adjustable forward or aft facing seat, with tables and leg rests if required.



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★ As ever Rumbolds are to the fore, having envisaged and provided for the latest trends of modern seat design.

Strength and extreme lightness.

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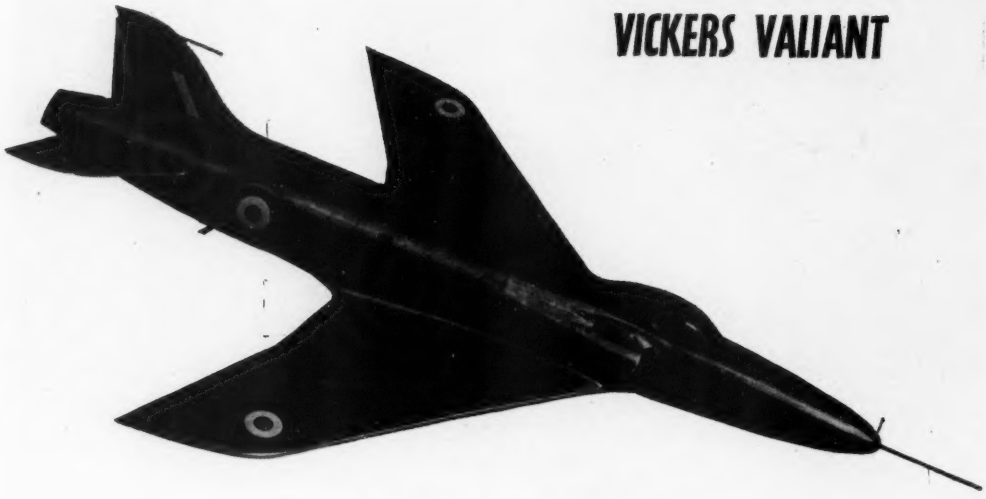
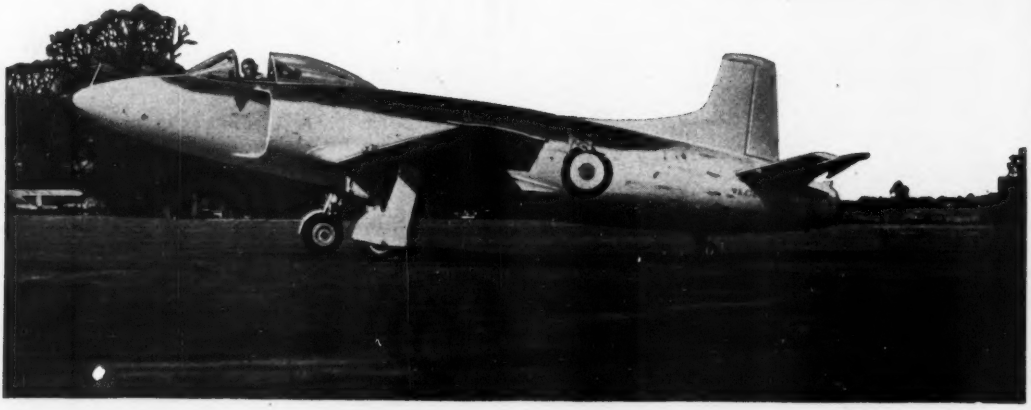
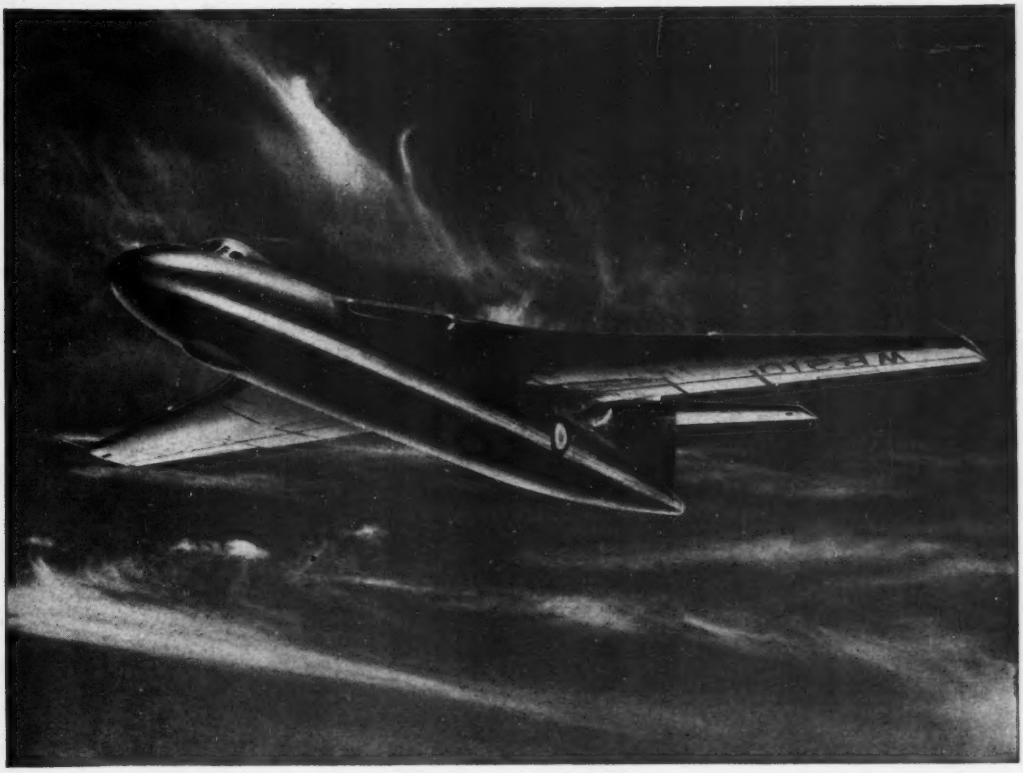


DESIGNED AND





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the new generation of British fighters and bombers will uphold the traditions established throughout the free world by the Spitfire, the Seafire and the Wellington.

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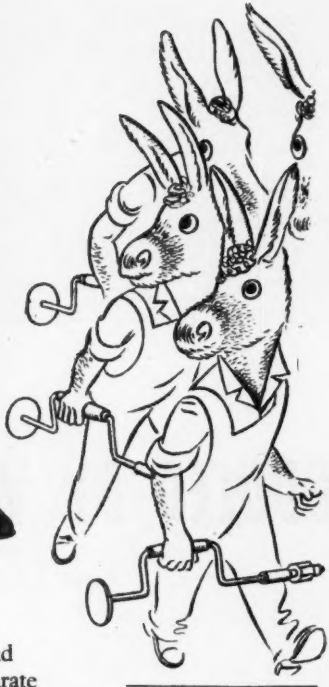
let Desoutter's Little Horses do the donkey work



ALL OVER THE WORLD men are busily engaged hour after hour twiddling screw-drivers and turning braces. Soon their wrists ache, their arms tire, their backs develop lumbago and their throats cry out for lubrication. By the time they get home they are so exhausted they can't fancy the tasty meals their wives have prepared for them. Quarrels ensue, pieces of fish and potato are flung about, followed by floods of tears, separate bedrooms and even divorce. And all this because they don't or won't learn about Desoutter's Little Horses. Lord what fools these mortals be—as our Managing Director rather wittily remarked.

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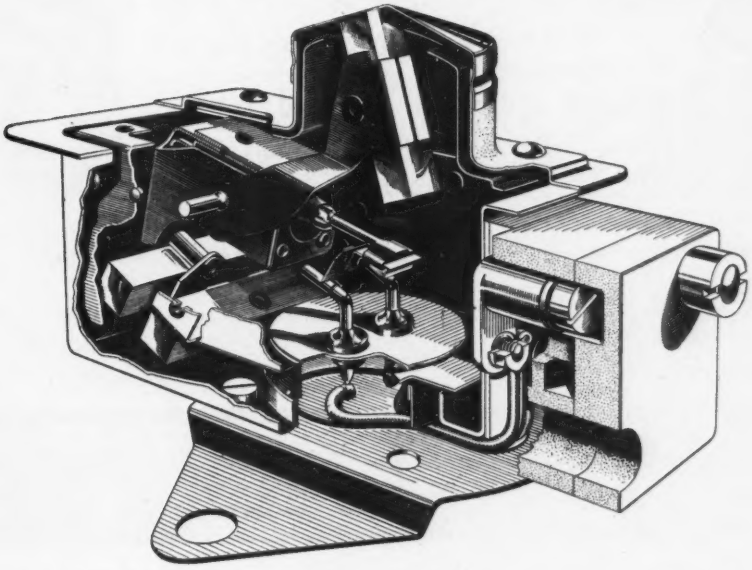
DESOUTTER BROS. LTD., THE HYDE, HENDON, LONDON, N.W.9. TELEPHONE: COLINDALE 6346 (5 LINES) 'GRAMS: DESPNUCO, HYDE, LONDON.
CBC 225

GRAVINER MAGNETIC FIRE DETECTOR

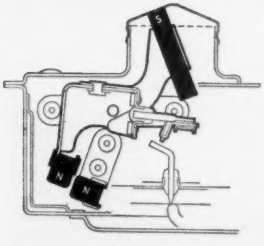
Patents applied for

(RESETTING TYPE) THE COMPLETE SYSTEM COMPRISES A

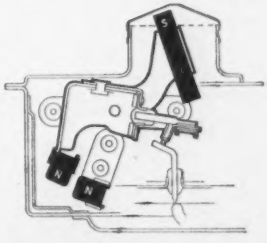
DETECTOR – weight only 2½ ozs – A WARNING LAMP & BATTERY



The operation of the Graviner Magnetic Fire Detector is based on the Curie point principle whereby certain metals lose their magnetic properties on reaching certain temperatures. The adoption of this principle in fire detection is primarily advantageous in that no relays or valve amplifiers are required. The alloy of the temperature sensing element governs the operating temperature and this figure cannot alter in service. The detector is robust, hermetically sealed, unaffected by "g" or vibration and can be installed in fire zones with ambient air temperatures as high as 290°C. Detection time in standard flame under two seconds.



In the left illustration the top magnet on the beam assembly is attracted to the Curie cap, but its attraction ceases when a pre-determined temperature is reached, and the two bottom magnets swing the beam assembly to the position shown in the right hand illustration, completing an electrical circuit. When the temperature of the sensing element is reduced, the magnetic attraction between the Curie cap and the top magnet is restored, the beam is swung to its original position and the circuit is broken.



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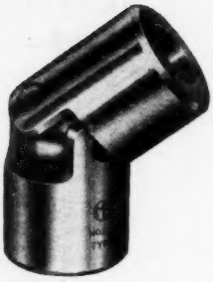
HOOKE'S TYPE JOINTS

A joint developed for less severe duty than the ME patent ball joint. Inexpensive to fit and needs no telescoping sleeves. Will stand both tension and compression loads. Nine standard sizes for shaft diameters of ¼ in. to 1½ in.



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for London Airport—

S·M·D.

OF SLOUGH

★ *Our illustrations show the method of erecting the main frames by winching.*

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From 0 to 39,372 feet in 3 minutes 7 seconds

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And perfection is not obtained thro' accident,

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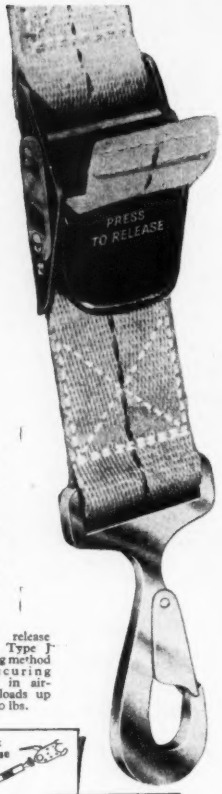
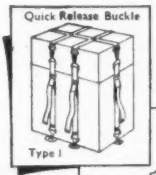
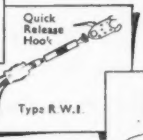
The *Fast* POSITIVE LASHING for all loads !



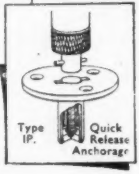
Aerolex Quick Release Gear makes the lashing and stowing of Freight in Aircraft simple and easy to carry out. Lashing equipment that is fast and positive for all loads whether compact or bulky.



Quick release buckle Type J showing method for securing freight in aircraft—loads up to 2,240 lbs.



Quick release wire lashing gear Type R.W. 1, fitted with roller snap hook, simple to operate, safe for loads to 1½ tons



Quick release anchorage Type No. 1 complete with standard pin plug Type 1P for loads up to ¾ ton. Webbing to suit requirements.

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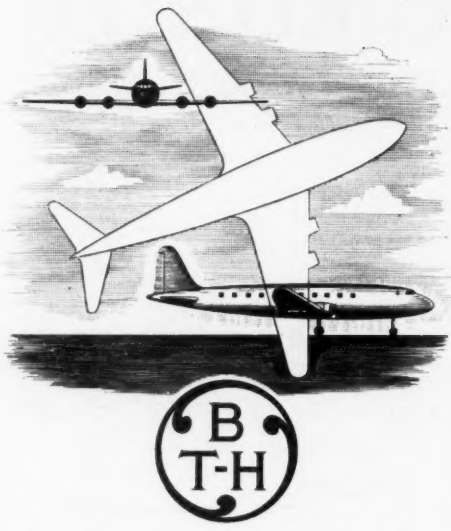

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Whatever the type of aircraft, BTH can design and develop the complete electric power system and supply the appropriate equipment, including:—actuators, A.C. and D.C. motors and generators; motor-generating sets with electronic regulators; gas-operated turbo-starters; Mazda lamps, etc. With over fifty-four years' experience of the manufacture of electrical equipment, and extensive manufacturing resources devoted entirely to these products, BTH is in an unrivalled position to fulfil the needs of aircraft industry.

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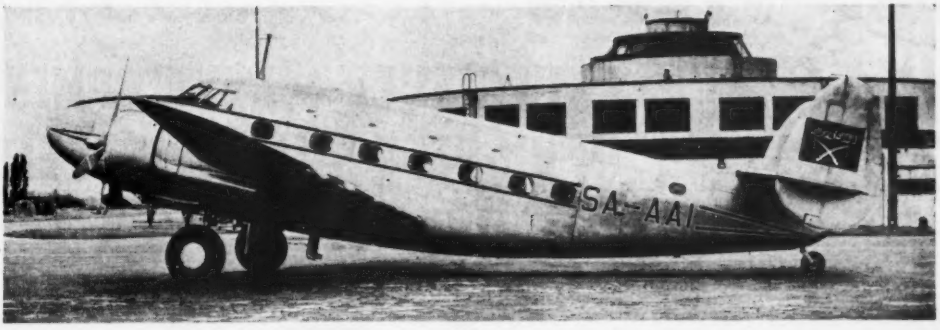
MODEL 18-56 - - - - - WRIGHT CYCLONE R1820-87



On behalf of the Government of Saudi Arabia—

W. S. SHACKLETON, LTD. are instructed to offer, 4 LOCKHEED "LODESTARS" — One of which is pictured above and the interior below.

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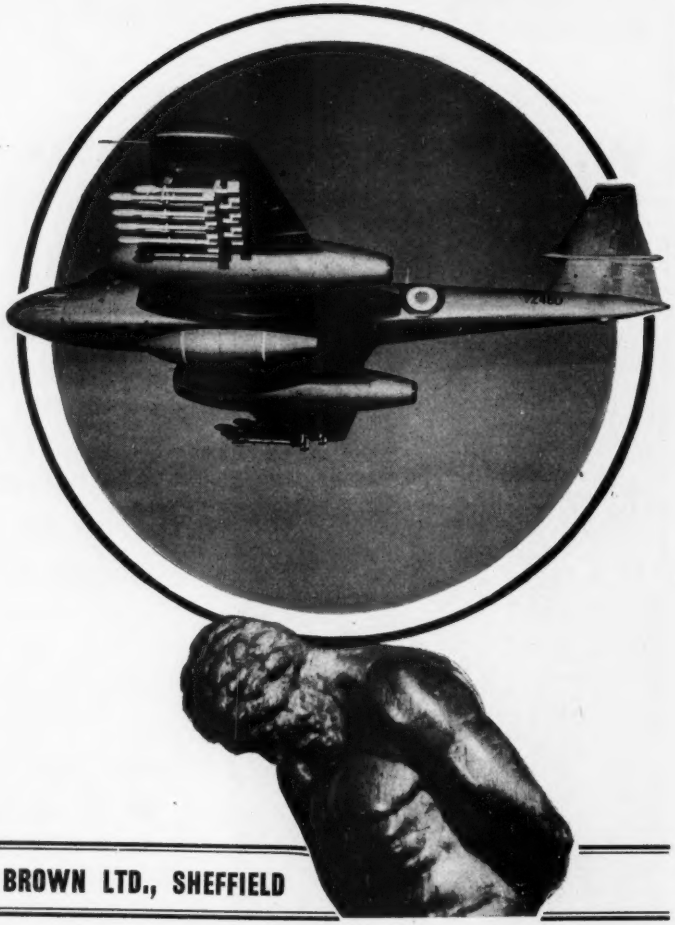

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THOS. FIRTH & JOHN BROWN LTD., SHEFFIELD

An Announcement . . .

DUREX ABRASIVES LTD wish to announce that as from June 14th, 1951, the name of the Company has been changed and is now the MINNESOTA MINING & MANUFACTURING COMPANY LTD.

Identification will be as before, except that the words "Scotch Boy" will be used instead of "Durex" as a prefix to the name of the material, e.g., "Scotch Boy Tapes" instead of "Durex Tapes"

Existing high standards in the quality of the products will be maintained, the change is in name only.

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"SCOTCH BOY" Masking Tape is supplied in rolls 72 yds. long and in a variety of widths

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OF THE ARMSTRONG SIDDELEY

SAPPHIRE

IS LITERALLY THE SOLENOID VALVE FOR ITS TORCH IGNITION SYSTEM, DESIGNED AND PRODUCED IN QUANTITY

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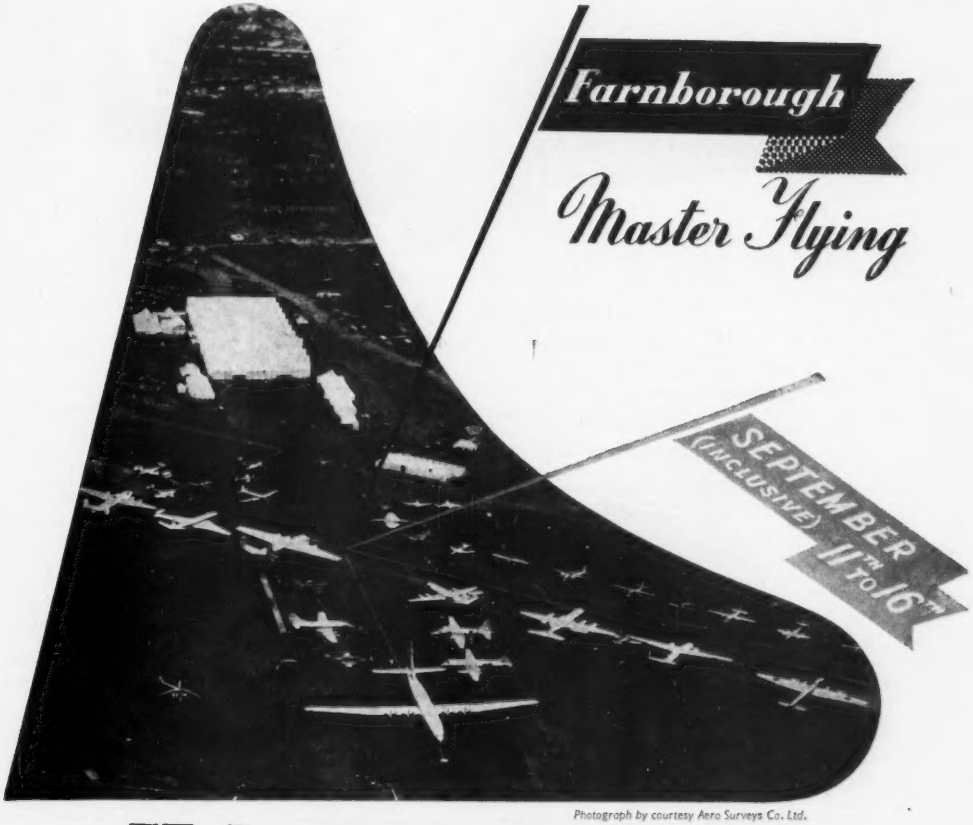
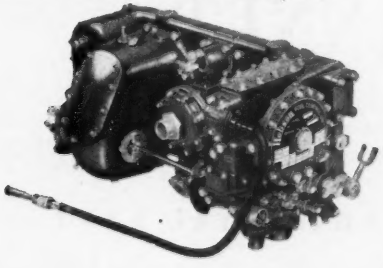
DESIGNERS AND MANUFACTURERS OF UNDERCARRIAGES AND HYDRAULIC AND PNEUMATIC EQUIPMENT



Photograph by courtesy Aero Surveys Co. Ltd.

Hobson

Master Control



To our many friends who will be visiting the 12th S.B.A.C. Flying Display & Exhibition, we extend a cordial invitation to visit our **Stand No. 55** where a complete range of Hobson Aircraft & Engine Accessories will be on display.

Injection Carburetters

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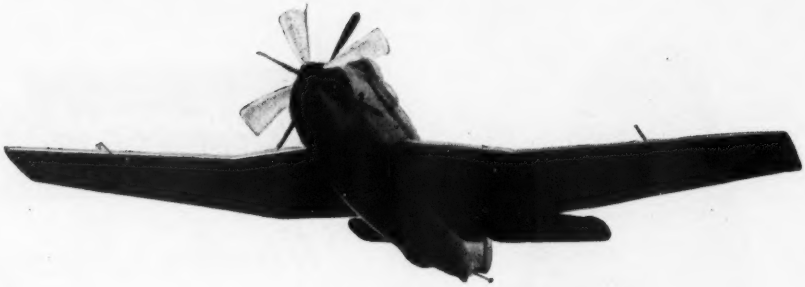
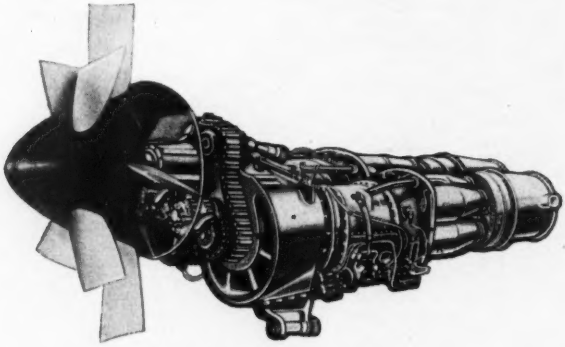


'SINGLE DRAG'

The design benefits of a single engine formula



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EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

TECHNICAL EDITOR
C. B. BAILEY-WATSON, B.A.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:

DORSET HOUSE,
STAMFORD STREET,
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COVENTRY
8-10, Corporation Street.
Telegrams, Autocar, Coventry.
Telephone, Coventry 5210.

BIRMINGHAM, 2
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MANCHESTER, 3
260, Deansgate.
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Strength to Strength

A CARDINAL precept among leader-writers is that statistics must be shunned; but some pre-Farnborough figures issued by the S.B.A.C. are too significant to be passed over without editorial comment. Especially gratifying is the way in which they bear out our long-held view that year by year the affair grows, and will continue to grow, bigger and better than ever. Remarkably enough, this view is not universally shared, for one is invariably assured at each successive display that there will be no gathering the following year, either because of the international situation or because the industry has shot its bolt. And so we give the figures to date.

In the first display, at Hendon in 1932, there were 34 aircraft; in 1937, thirty-eight, in 1946, fifty, and in the present year of grace, the readily memorized total of 51. For the same years the average weight in pounds of participating aircraft has increased as 7,180, 8,200, 22,000 and (this year's figure is approximate, due to the presence of secret types) "over 35,500." The last statistical sequence—for speed in m.p.h.—is perhaps even more remarkable, progressing as it does from 140 up to 192, 275, and, this year, to "over 400."

It may be that by the time this appears in print Messrs. Lithgow, Duke and Co. will have shown this last figure to have been over-cautiously calculated. We shall see.

More Haste, More Speed

IN voicing regret that progress with helicopter construction is not more rapid, we know that our view is shared by many, and particularly by top executives of B.E.A. The industry has not been slow in understanding what is wanted and, in fact, has at times been designing in advance of demand; but the rotating-wing art, old in theory, is young in practice, and the way of development still means hard going and few rewards.

A big change, however, now seems imminent. In the past the Services have accorded little more than token support to the faith of a few far-seeing officers; today they have proof positive of the capabilities of existing general-purpose helicopters as demonstrated in Korea. Firm military requirements are at last being formulated which will give the necessary lead and enable the British industry to move forward with greater speed.

In the commercial field, also, theory is giving way slowly to practical experience. Already helicopters may be accurately described as self-supporting in certain specialized spheres such as that of agriculture. Important though this is, it is of limited consequence in comparison with the possibilities clearly foreseen by certain airline operators. Here again, requirements are crystallizing out and the aircraft industry is getting something tangible to work on.

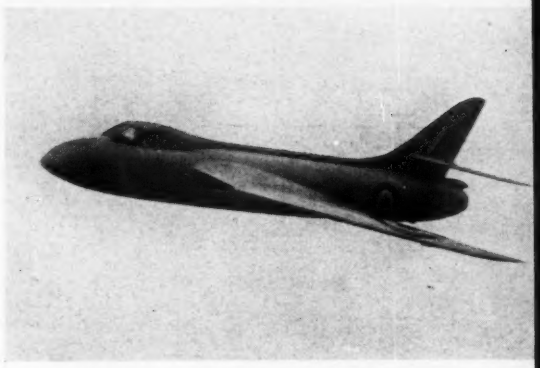
Of the many factors which at present hold helicopter operating costs at a non-competitive level, two call for immediate consideration : the first is the high initial cost, the second the low utilization which a limited air speed imposes. Both these problems invite a bold approach. The British Isles and Western Europe are most suitable areas for helicopter operations, many of the present city-to-city stages being near-ideal in length. In a year or two a reasonably large market would be assured for a commercial 20/40-seater helicopter in accord with Lord Douglas' "Green Line coach" analogy. Britain should take advantage of her strategic position in good time and design for, build for, and secure that Home and European market. In this way, and with reasonable assistance from Mr. Peter Masefield's "military camel," the first economic necessity—sizeable orders—should be met.

As to block speed, the present small helicopter offers only about half what is required. Indications are that something on the lines of the so-called convertiplane will find increasing favour as one answer. By transferring some of the load from the rotor disc to small wings, and perhaps some of the propulsive effort to airscrews as well, 200 m.p.h. may be attainable. That constructors are working along such lines is apparent from models and drawings at Farnborough. Transformation of these projects into full-scale 20-, 30- and 40-seater rotorliners should—and must—be tackled with all haste.

FARNBOROUGH: THE OPENING PHASES

Tuesday's Brilliant Flying Display Sets the Pace for British Aviation's Great Week

"FLIGHT" PHOTOGRAPHS



Every line of the Avon-powered Hawker P.1067 intercepter is suggestive of speed. Not only was this borne out by its demonstrated performance, but, manoeuvrability proved to be of an extremely high order.

ON this and the following page is a report of the opening stages of the exhibition; and on the succeeding two pages are further photographs, taken at Farnborough, of the participating aircraft. Next week we shall publish a comprehensive illustrated story of the whole week's activities, with specific references to the performances of individual pilots.

As this is written the Twelfth Flying Display and Exhibition of the Society of British Aircraft Constructors is under way at Farnborough. All the omens foretell another great occasion which can bring nothing but credit on our aircraft industry.

The influx of aircraft began on Sunday morning, September 9th, which was wise, for the weather had given no promise of allying itself with the organizers. By noon on Monday, however, there were still very obvious gaps in the carefully disposed parks, and even when, well into the afternoon, we finally willed ourselves to leave after our peep back-stage, some important performers had yet to book in. But everyone was in good heart, though there was general commiseration with Vickers-Supermarine that the Swift had force-landed near Chilbolton on Saturday, obliging them to substitute the closely-related, but previously shown, Type 535.

One of the brighter moments of Monday afternoon was the arrival of the G.A.L. 60, whereupon the loading doors were swung back and the ramp lowered to allow withdrawal of the 20-ft caravan and Land Rover (see page 352). The caravan was opened up, and, without further ado, the B. and G.A. people made us at home in traditional Brough style.

As we headed Farnboroughwards on the next day (which was consecrated to the technical fraternity) a mellow sun beamed over all; but a cloud carpet was spreading and the flying display opened beneath it. There was hardly a breath of wind, so the take-offs had no natural aid; even so, the Viscount 700 was up and away in double-quick time to lead the opening "circus." The Comet was absent and the Mamba-Marathon retired, but the Avro Ashton, Handley Page Hermes V, Bristol Proteus-Lincoln, Napier Nomad-Lincoln and Avro Shackleton made their respective bows with grace and agility. The Viscount banked low, with the port Darts at rest, and the Shackleton's remarkable climbs almost suggested that this massive machine was designed to intercept its quarry at great heights rather than in the ocean depths. The slow-running, contra-rotating Rotol airscrews of the Nomad-Lincoln attracted attention, while the Ashton (now fully equipped and furnished) and the quiet, handsome Hermes V showed advanced turbojet and turboprop performances respectively. The Proteus-Lincoln flew swiftly and quietly with both its Merlins stopped.

The Westland-Sikorsky S-51 was quickly off the mark to lower a passenger to the rescue of a comrade. Attached to the harness of No. 1, he was hauled aloft and both men were deposited in the allotted place. The Bristol Sycamore seemed livelier than ever and went astern with nonchalant precision.

Four light machines—the Percival Provost, Auster Aiglet, Auster Model S and Scottish Aviation Pioneer—were next in the air together. The Provost climbed sharply after running for a very few yards and temporarily vanished skyward, leaving the stage free for the Austers, which leaped, spun and generally diverted and impressed the assembly. With its Cirrus Bombardier driving a variable-pitch airscrew, the Model S demonstrated a quite exceptional getaway and initial climb. Then the Pioneer projected itself into the air, landed, and was away again with quite bewildering speed, after which the Provost came down from cloudland in a ten-turn spin before snapping into a first-rate aerobatic routine.

The Sapphire-Canberra was just rearing up to unstick when something prompted the pilot to thrust the nosewheel back on to the runway and retire behind the scenes. Other non-starters in the same circus were the Westland Wyvern and Fairey Firefly 7. The de Havilland Dove and Heron were, in a word, charming (from some angles, in its B.E.A. livery, the Heron looked for all the world like a baby Viscount), and the ivory-finished Short Sealand amphibian showed its paces with a Gipsy Queen shut down.

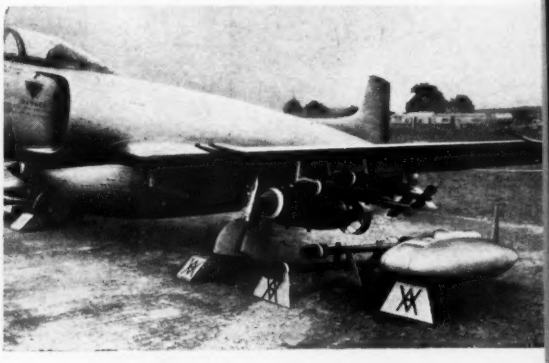
Of juggernaut aspect, the Blackburn and General Aircraft G.A.L.60 lifted its array of wheels off the runway with a complete absence of fuss and flew directly overhead to display its vast spread of wing and breadth of fuselage before coming in for a landing. Those who had not been forewarned must have been astonished when, under the action of eight wheel-brakes and four reversed airscrews, the huge freighter came to rest in little more than 150 yd and proceeded to taxi backwards.

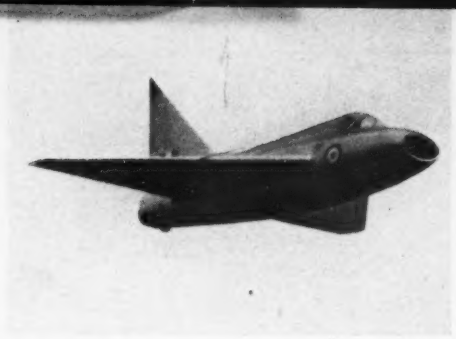
The latest (three-cockpit) Fairey Gannet left the ground on half of its Double Mamba power, with the rear airscrew stationary. It returned past the enclosures with both "fans" whining and proceeded to roll and otherwise disport itself with great vivacity before making a simulated deck-landing approach and folding its wings while taxying.

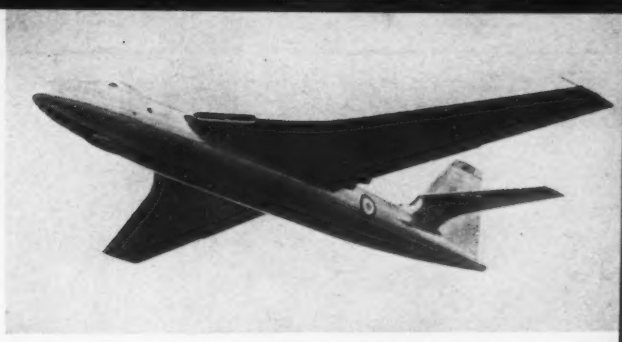
Having been held down after take-off, the Canberra P.R.3 accumulated a superabundance of speed for an upward roll. Its appearance and comportment in very tight turns and other manœuvres were equally admired. Then the very earth shook as four Avons accelerated the massive Short S.A./4 bomber up the runway for a sequence of very low passes, tight turns (with flaps lowered), and—particularly impressive—a very slow fly-past. Here, it would seem, is a fast, capacious and well-tempered load-carrier.

Next, the Valiant surged forward to make its bow, and a splendid

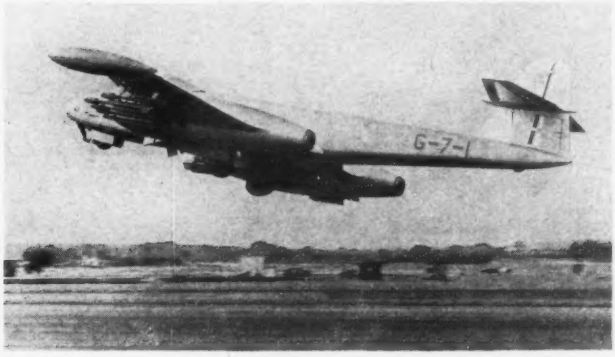
The Vickers-Supermarine Attacker (Type 538) was statically displayed with a 1,000 lb bomb and two R.P.s under each wing, and with additional rockets and slipper-type auxiliary tanks in juxtaposition.







New shapes. (Left) The Boulton Paul P.111 high-speed research aircraft (Rolls-Royce Nene) and (right) the Vickers-Armstrongs Valiant B.1 jet bomber (four Rolls-Royce Avons). Both types were making their first public appearance and neither left any doubt as to its fitness-for-purpose.



(Left) The Gloster private-venture tactical ground-attack Meteor (two Rolls-Royce Derwents) goes into a turn from take-off. It went through a remarkable aerobatic performance with 24 R.P.s and wing-tip tanks. On the right is the Scottish Aviation Pioneer, effectively slotted and flapped.

sight it was as it went into a climbing turn from take-off while the wheels were still stowing themselves away. Its size notwithstanding, the Valiant looked really fast and displayed a Canberra-like rate of climb into cloud. The landing, with the double-slotted flaps in evidence, was slow, and altogether in keeping with the exceptional qualities of this new British bomber. The recently rumoured interest of the U.S.A.F. could readily be appreciated while watching this magnificent machine in action.

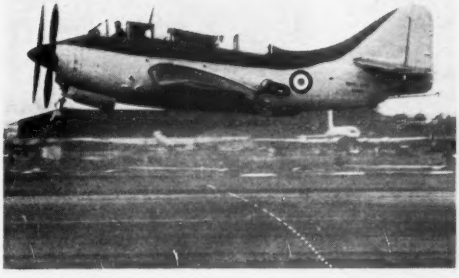
As if in salute to the Valiant as it landed, the de Havilland Sea Venom N.F.20 came diving at great speed over the arena for a masterly exposition of its powers. Whether in cloud-scouring loops or high-g turns at low level it impressed equally.

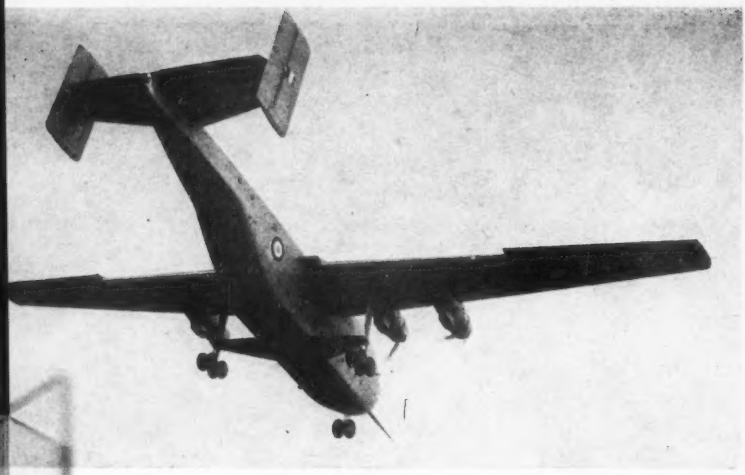
Like its own shape, the rendering by the "navalized" Hawker P.1052 was in all senses beautiful. Its pilot generally took plenty of sky room and used it to the very best advantage. Another Hawker Siddeley star turn followed, in the form of Gloster's private-venture ground-attack Meteor, with its 24 rockets and wing-tip tanks red-painted to draw attention to its heavy-laden condition. The first run would have been fast and low enough to vex the keenest A.A. guns, but the qualities of both aircraft and pilot were most readily apparent in two spins, one of them from a stall off a sustained, truly vertical climb. Altogether a remarkable combination of fearsomeness and docility.

Now in the fashion with its wing tanks at the tips instead of beneath, the Armstrong-Whitworth-developed Meteor N.F.11 night fighter gave further proof of the way in which the Meteor reconciles load-carrying ability with performance.

The de Havilland Vampire Trainer, looking very spruce and collegiate with its training-yellow stripes, then proceeded to show how a 1951 jet trainer can, or should, fly. It was followed by a

Two new carrier-borne types for Naval aviation: (Left) The Fairey Gannet anti-submarine aircraft (Armstrong Siddeley Double Mamba), showing the latest cockpit arrangement, and (at right) the de Havilland Sea Venom N.F. 20 two-seater night fighter powered with a de Havilland Ghost.



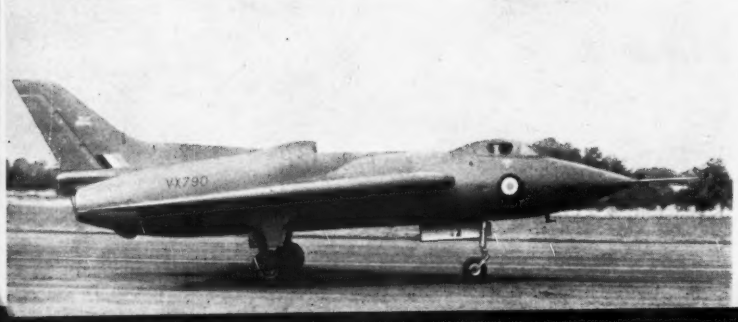


FARNBOROUGH : THE OPENING PHASES

"FLIGHT" PHOTOGRAPHS

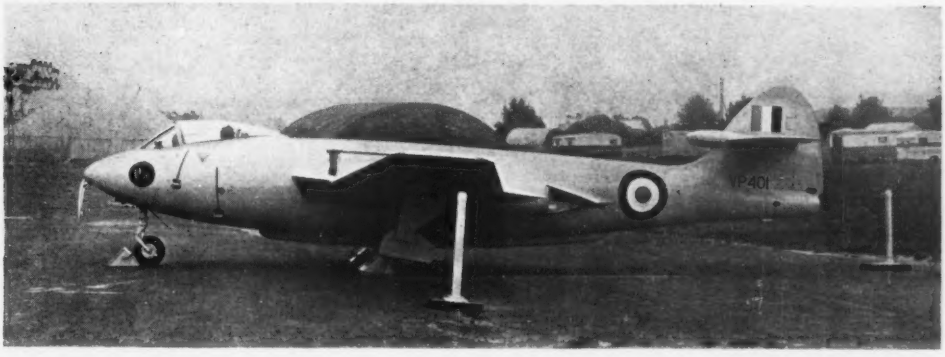
Flaps down (their area has been somewhat reduced since last year), the Blackburn and General Aircraft G.A.L. 60 is seen on the left making its first approach. Below is a frontal aspect of the aggressive-looking Short S.A./4 jet bomber, in which the massive nacelles and wide-track undercarriage are seen to particular advantage.

Below is seen the business end of one of the S.A./4's twin-Avon nacelles and details of the four-wheel bogie undercarriage. Left, the Viscount 700 is shown on the approach, while below it the Avro 707B delta-wing research aircraft taxies in.



A flying test-bed of more than usual interest, if not beauty—the Napier Nomad-Lincoln, seen arriving at Farnborough on Merlin-power alone.

Externally similar to the Mk 1, the second (Mk 2) Avro Ashton is fully furnished and equipped for the investigation of pressurizing, humidifying and other problems at 40,000ft or thereabouts.



Truly Hawker-Siddeley is the P.1072 above, adapted for development-flying with the Armstrong Siddeley Snarler liquid-fuel rocket motor.

The Westland Wyvern T.F.4, complete with torpedo, auxiliary tanks and —added since last year— "fences" placed inboard of the ailerons.

FARNBOROUGH: THE OPENING PHASES . . .

modified Venom single-seater which made full use of the last ounce of thrust delivered by its "reheated" Ghost. The tail-pipe orifice, incidentally, is not adjustable.

The cloud opened up very obligingly for the super-speed fighters now due to make their number. Hawker's P.1067 (even more beautiful in the flesh than in the best of the few pictures hitherto released) climbed away at a most satisfactory rate and angle. Most astonishing, however, was its speed as, at 50ft or so, it seared along the enclosures on what must have been the fastest run yet observed at a Farnborough display. Three successive rolls were completed with quite exceptional speed and the Hawker team had the satisfaction of making one of the deepest impressions of the whole display.

The Vickers-Supermarine 535, standing-in for the Swift, put up another of its flashing performances, turning and rolling with great speed and precision. On one fast turn the flaps were seen to be partially extended, and during the landing the specially provided tailwheels appeared to touch the runway.

Boulton Paul's delta-winged P.111 now made its public début by flying up the runway at a pace which certainly justified its description of "high-speed research aircraft." Its rate of roll was all that one would expect from a short span and Boulton Paul design. The landing was certainly on the "hot" side, but the parachute brake functioned with evident effect.

Last (the Supermarine 508 not having arrived by this time) came the Avro 707A, so highly finished that it resembled its model in the Science Museum. It took off in its characteristically nose-up attitude and turned as soon as the wheels had left the runway. A low inverted run bespoke the complete confidence of the pilot, as did rolls and rapid "whip-overs" from bank to bank near the ground. Two landings were made to demonstrate the techniques impartially employed. The first, at a very sharp angle of attack, was made without the braking parachute; on the second, using a flatter approach, the 'chute blossomed while the aircraft was still 10ft or so above the runway. Technically, the displays of the Boulton Paul and Avro deltas were among the most significant yet seen in the whole series of S.B.A.C. displays.

As the guests dispersed, the Vickers-Supermarine 508 swept over with a mighty Avon roar, landed and took its place in the distinguished company assembled for this great occasion.

Round "The Static"

As for the static exhibition—well, as ever, it is magnificent. Situated at the eastern extremity of the north-west/south-east runway, the exhibition is housed under a multiple marquee comprising literally acres of canvas. Beneath this admirably light but (in the sunshine and with the milling hordes of visitors) extremely warm covering, the stands are arranged in avenues and streets extending from the central squares which accommodate the displays of the "big" concerns such as Hawker Siddeley, de Havillands, Bristol, etc. There are, in all, no fewer than 195 stands, each carried out in the same decorative scheme of cream and blue, but different from all its fellows in the individuality of display.

It is not our purpose here to give more than a very general impression of the static show—advance notes have already been published and a review will appear next week—but, nevertheless, mention must certainly be made of the Napier Nomad compound engine : a massive and most unusual-looking power unit, it was continually surrounded by a crowd of people as it stood glistening effulgently on the Napier stand. Credited with a specific fuel consumption of 0.36 lb/e.s.h.p./hr, the Nomad (or a development of it) would appear to be certain of a future. Another arresting exhibit is the slowly turning 16ft-diameter de Havilland airscrew for the Bristol 175 Britannia; by contrast to the highly polished mottled surface of the ordinary dural blades so commonly seen, this airscrew's hollow-steel square-tipped blades have a matt black finish. It was also good to see on the de Havilland stand a very beautiful model of the Comet, in the gold-lined scarlet livery of Canadian Pacific Air Lines. The model bears the name *Empress of Vancouver*.

Sufficient has perhaps been said, by mention of these few exhibits, to indicate that the quality of this year's static exhibition is as high as ever and, to complement the outstanding interest of the flying part of the event, the range of technical variety sets a new high standard.

THE WILBUR WRIGHT EVENING

BEFORE the delivery of the 39th Wilbur Wright Memorial Lecture (see pages 371-373), given by Mr. A. E. Raymond before members of the Royal Aeronautical Society and the Institute of the Aeronautical Sciences at the Royal Institution on Monday, September 10th, the president of the R.Ae.S., Major F. B. Halford, presented the Society's annual awards, as is the custom at this important lecture. The presentations were made as follows :—

The Society's Gold Medal (the highest honour which the Society can confer, for work of an outstanding nature in aeronautics).—Awarded posthumously to W. G. A. Perring in recognition of his distinguished services in the aeronautical sciences.

The Society's Silver Medal (for work of an outstanding nature in aeronautics).—S. B. Gates, for his work on the stability and control of aircraft.

British Gold Medal (for practical achievement in aircraft design).—A. E. Russell, for his work with the Bristol Aeroplane Co., Ltd.

British Silver Medal (for practical achievement leading to advancement in aeronautics).—G/C. John Cunningham, D.S.O., D.F.C., for his work as chief test pilot with the de Havilland Aircraft Co., Ltd.

R. P. Alston Memorial Prize (for practical achievement associated with the flight-testing of aircraft).—R. J. Falk, for flight-testing British delta-wing aircraft.

George Taylor (of Australia) Gold Medal (for the most valuable paper read during the previous R.Ae.S. session).—R. E. Bishop, for his paper on *Design for Maintenance*.

Simms Gold Medal (for the most valuable contribution on any subject allied to aeronautics).—Dr. G. S. Hislop, for his paper on *Investigation of Gusts*.

The Society's Bronze Medal (for work leading to an advance in aeronautics).—H. J. Pollard, for his many contributions to the development of aircraft construction.

Herbert Ackroyd Stuart Prize (for the most valuable contribution on applied thermodynamics read before, or received by, the Society).—A. V. Cleaver, for his paper on *Rockets and Assisted Take-Off*.

Edward Busk Memorial Prize (for the most valuable contribution on applied aerodynamics).—R. Hills, for his paper on *The Use of Wind Tunnel Model Data in Aerodynamic Design*.

Following presentation of the medals and awards, the president announced that the recipients of honorary fellowships of the Society this year numbered three; and he thereupon presented scrolls to Sir Bennett Melvill Jones and Sir Henry Tizard; Mr. C. C. Walker, the third member of the trio, was unable to be present personally to receive his honour.

When Mr. Raymond had delivered his paper—a quite outstanding lecture even by the high standard of the Wright Memorial lectures of the past—a vote of thanks was accorded him by Maj. G. P. Bulman, past-president of the Society, as deputy for Maj. Halford, who was suffering from a "subsonic" throat. Maj. Bulman spoke quietly and with great sincerity, and likened the lecture to the summing-up of a judge at a trial, the prosecution and defence of which had been given the previous week at the joint R.Ae.S.-I.Ae.S. Conference at Brighton. The lecture, he said, put the whole thing in right perspective and was, in fact, a challenge to the future.

The vote of thanks was seconded—in contrastingly humorous vein—by the recently retired secretary of the Society, Capt. J. Laurence Pritchard. He said that he had listened to something like 30 of these lectures, and genuinely thought that Mr. Raymond's was the most remarkable. Capt. Pritchard was quite sincere in his belief that the lecture was one which would live, and he felt it a very great honour to second the vote of thanks. Mr. Raymond was then given a tremendous ovation by the audience of well over 400 people—itself something of a record number even for a Wright Memorial lecture.

Following this notable occasion, the greater part of the audience (which, naturally enough, included many of the American visitors) went from the Royal Institution to No. 4, Hamilton Place for a reception given by the president of the Society, Maj. F. B. Halford, Mrs. Halford, the Council and their ladies.

GILES REID-WALKER

HIS many friends in the world of private and sporting aviation will be grieved to hear of the death of Giles Reid-Walker, at the early age of 26, in a road accident in South Africa on August 31st.

A private aircraft owner and a member of the Wolverhampton Aero Club, Mr. Reid-Walker had competed in a number of air races and other sporting events; in 1949, flying a Piper PA-12, he won the Goodyear Trophy Race.

He entered the R.A.F. from the Cambridge University Air Squadron during the latter part of the war, but—to his personal disappointment—had no chance of operational flying, for V.E. Day came while he was still with an S.F.T.S. in South Africa.

BRIGHTON CONCOURSE

Impressions of the Third Anglo-American Aeronautical Conference: The Concluding Dinner

BRIGHTON has a wide and undoubtedly well-merited reputation for being a place where, in surroundings which vary from the bizarre to the bazaar, one can have a good time. We were able to gather from chatting to various of the delegates, plus what was self-evident at the Mayoral reception on Wednesday evening, that last week's R.Ae.S.-I.Ae.S Aeronautical Conference was a considerable and unqualified success. To the erstwhile secretary of the "royal and ancient," Captain J. Laurence Pritchard, must be accorded unstinted recognition for the success of the whole affair; he made the organization particularly his own, and indeed deserves the full meed of praise for having done such a fine job. In saying this we are, of course, implying no lack of recognition of the great deal of extremely hard work so ably done by the others of the R.Ae.S. staff. Everyone concerned has reason to feel justifiably proud.

The quality of the lectures presented, both British and American, was unusually high, and it is our intention to publish abstracts from several of the papers in forthcoming issues of *Flight*. The criticism has been voiced that, in the discussions which followed presentation of the various papers, the American delegates took an unduly modest part. It should, however, be pointed out that this was not the direct fault of the visitors, for few of them had received copies of the papers before arriving at Brighton.

There can be no doubt that the major value of such international gatherings as the Brighton Conference lies not merely in the presentation of individual ideas as exemplified in the lectures: the real value is a rather more subtle quantity. Delegates (and, no less important, their wives) meet on common ground in circumstances and surroundings which contribute strongly to ensuring that "a good time is had by all." The Conference offered a pleasantly ordered meeting ground for amiable exchange between British and American "opposite numbers"—and amity, particularly amity of understanding, is the true value.

The Dinner

The Conference Dinner, a sparkling affair, took place at the Grand Hotel on the night of September 7th.

Mr. W. A. M. Burden, F.I.Ae.S., proposing "The Royal Aeronautical Society," described its founding in 1866 as a tribute to British genius. His remark that at gatherings such as the Conference a sense of humour was necessary, as well as co-operation, obviously met with general accord.

Responding, the president, Maj. F. B. Halford, read a message from "an old friend"—Lester Gardner—then another from an honorary fellow of the R.Ae.S. This latter ran as follows:

> "It gives me much pleasure, as an honorary fellow of the oldest aeronautical society in the world, to learn of the lead it has taken over the years, with the Institute of the Aeronautical Society of America, to foster the closest technical co-operation between this country and the United States in the whole field of aerial development. The conferences between the leading aeronautical technicians of the United States and the United Kingdom increase that understanding and friendship which are vital for successful partnership in our struggle for the way of life which is our common heritage. I wish you well in your deliberations."

The signature was "Winston S. Churchill." The president described it as "a typical Churchillian epitome" of what must have been at the back of all minds that night.

World War I, the president went on to recall, ended with but a poor understanding between Britain and America, but valuable seeds were sown by the Schneider Trophy Races, especially that of 1924. Other milestones were the commencement in 1926, of a series of British visits to America, followed by a crop of American visits to these shores; the Wilbur Wright lectures; the MacRobertson Race to Australia; Mr. "Ted" Wright's classic lecture on aircraft production, in 1938; and, finally, the advent of the gas turbine which culminated only recently in providing "the last jewel in this technical tiara of transatlantic co-operation."

In this war-fearing world, continued Maj. Halford, we ought to thank our lucky stars (and stripes too!) that the two nations were so complementary. Speaking as a member of the aircraft industry, however, he said, quite frankly, that at times he did not feel that there was the complete two-way technical traffic that there should be. If not watched very carefully, "security" could become a bogey. The faster technical progress was, the less damage leakages could do, and the way to defeat the copyist was to move faster still.

At the Conference Dinner: (left to right) Maj. F. B. Halford, Rear-Admiral L. B. Richardson, Mrs. Halford and Mr. W. A. M. Burden.

Rising to propose "The Institute of the Aeronautical Sciences," Lord Brabazon of Tara remarked that it had a Fifth Avenue address and that the R.Ae.S. was in Park Lane. "Just think," he said, "where we have got in 50 years." He recalled the "scowling" at the first I.C.A.O. meeting and the inspired idea of "elevenses" which soon had everyone addressing the other by his christian name. He complimented the Americans on the wonders they had achieved in aeronautics, and on their "unrivalled technological progressiveness" which was "rushing along at a bewildering speed." He hoped they would find in British achievements a worthy yardstick by which to measure their own accomplishments.

Rear-Admiral L. B. Richardson, U.S.N. (Ret.), president of the Institute of the Aeronautical Sciences, reminded his audience that the Institute was 20 years old next January, whereas the R.Ae.S. was 86. The Institute looked up to its "godparent society," as Lester Gardner had styled it.

Mr. S. Paul Johnston referred to the magnificent job done by the R.Ae.S. staff in general and by Capt. J. Laurence Pritchard in particular. Dr. A. M. Ballantyne, the new secretary, was a new friend, to whom full co-operation was pledged.

Capt. Laurence Pritchard made an interesting historical allusion to Brighton's connection with aeronautics. In 1912, he recalled, an American named Glenn Curtiss had arrived there with his "flying boat." When he returned he took with him a young man called Porte who was later responsible for some of our biggest marine aircraft.

Capt. Pritchard paid graceful tribute to his staff at the R.Ae.S., and to his wife, for helping him during his long tenure of office.

The dinner and speeches being concluded, the company took the floor, the Americans setting the pace with a square dance.

MESSAGES OF GOODWILL

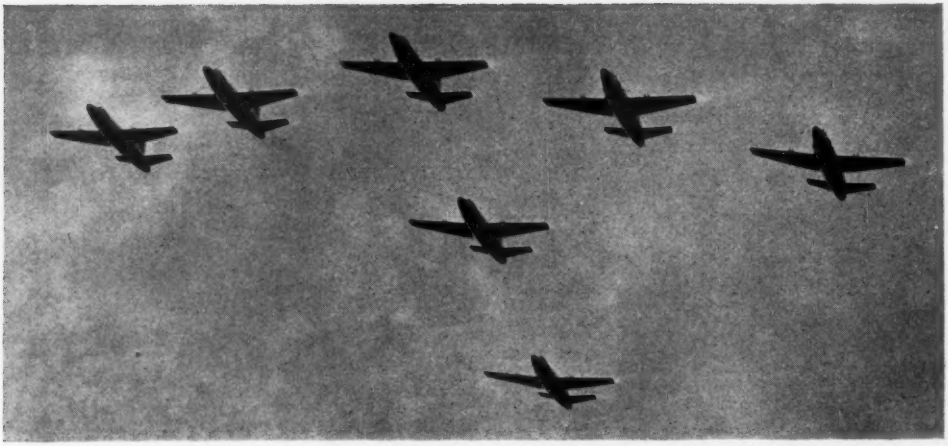
IN reply to loyal greetings sent to Balmoral by Major Halford on behalf of the delegates, the following was received from the private secretary to **His Majesty the King**:—

"The King sincerely thanks the Council and Members of the Royal Aeronautical Society for their kind and loyal message sent on the occasion of the 3rd Anglo-American Aeronautical Conference which His Majesty as their Patron warmly appreciates."

Good wishes for the success of the Conference were received from the **Prime Minister** and from the **President of the United States**, as follows:—

"I welcome and wish every success to the Third Anglo-American Aeronautical Conference. I welcome it because I believe the constant interchange of knowledge and ideas must ultimately be for the everlasting benefit of the world. I wish it success in its efforts to solve some of these problems so urgently awaiting solution for the safety and comfort of this vital form of transport."—C. R. ATTLEE.

"A complete understanding with the people of Great Britain at all levels is of the utmost importance in these times of world crisis. In the field of aeronautical science the closest possible collaboration is highly desirable. For this reason I hope that the third conference between the Royal Aeronautical Society and the Institute of the Aeronautical Sciences will strengthen the bond that already exists between the aeronautical engineering professions on both sides of the Atlantic. I wish the conference every possible success."—HARRY TRUMAN.



THE NAVY EXCELS

A Fine Display at Ford: First Attacker Squadron on Parade

(Above) Proud as peacocks with their newly delivered Attackers, pilots of 800 Squadron gave a formation display par excellence. (Below) Lined up in the dispersal area, the machines convey an unusual impression—as did Spitfires in their day—of dignity combined with striking power.

THE magnificent air display staged by the Navy last Saturday at Ford (H.M.S. *Peregrine*) near Shoreham, was, to say the least of it, an excellent testimonial to the efficiency of the Senior Service. Not only did the organizing officers plan the most ambitious flying programme ever sponsored by the Navy, but even achieved the near-impossible by coming to terms with the weather, which, although looking a little doubtful at first, soon entered into the spirit of things and ended up by providing positively ideal sky conditions for aerobatic demonstrations of jettery. It was particularly important that good weather should prevail, for the Navy was anxious to show-off its new Supermarine Attackers, of which No. 800 squadron—the first unit to be so equipped—had taken delivery only a few days before.

It is apparently a Naval custom to serve the *pièce* before the *hors d'œuvre*, for at 1430 hr precisely the expectant stillness was shattered by the deep roar of eight Nenes starting up. The Attackers' smart get-away at 10-sec. intervals in "carrier" take-off, the quick form-up and the determined way in which they kept station in rather bumpy air showed their pilots to be very much at home on their new mounts, despite the short period of familiarization.

While the Attackers re-formed between each of their impressive passes, a Lincoln had been making some genuine "nought feet" runs across the airfield with first one, and then two, engines feathered on the same side. As it came in, two "V.R." Seafires of 1832 squadron took off together to demonstrate the remarkable effectiveness of R.A.T.O. equipment. According to the pilot of the "assisted" machine (for comparative purposes the other take-off was normal) the effect as felt in the cockpit is "like a mule's kick."

The Attackers then stream-landed, clearing the sky for the next event. This proved to be a most unusual and highly entertaining affair—a race, in which both jet and piston-engined aircraft took part, over a course which permitted the competitors to remain well in view throughout. The piston-engined types, in order of take-off, were the Firefly Trainer, Firefly 6, Mosquito, Seafire 17, Sea Hornet and Sea Fury. These flew a rectangular course, and the two jets, the Sea Vampire and the Attacker, a circular one. The handicappers had excelled themselves and were rewarded by a very close finish, the Vampire of 703 squadron (Lt. Mearns) winning by a short head from the Attacker (Lt. Atterton), with the limit machine, the Firefly Trainer, battling its way gamely into third place.

Lt. Cdr. J. S. Sproule gave his usual skilful and polished exhibition in an Olympia sailplane, and was followed by two pilots of 702 squadron who showed off their Sea Vampires to advantage in a series of sky-sweeping manœuvres which included some particularly nice aileron turns and formation changes while inverted.

An amusing item was the "Pirates of Peregrine" in which two Grumman Avengers became very realistic men-of-war and, after engaging in a battle royal aloft, landed to disgorge eight bloodthirsty ruffians apiece, who set about each other with cutlasses.

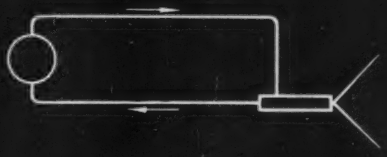
Six squadrons then participated in a massed carrier take-off, in which 16 Fireflies, 8 Seafires, 3 Mosquitos, 3 Hornets and 9 Attackers got away in fine style. A helicopter A.S.R. pick-up filled in the minutes while the squadrons positioned themselves; then the 39 aircraft made a lightning low-level attack on the airfield. A very noisy and soul-stirring event it proved to be, complete with flack and detonating targets.

As final evidence of the Navy's delight in their new jet equipment, Lt. Cdr. G. C. Baldwin, D.S.C., C.O. of 800 squadron, detached his aircraft from his Attacker formation to give a brilliant exposition of individual aerobatics.

Parachute jumping from a balloon and a massed fly-past by the squadrons terminated the flying programme, which had unquestionably been the best Naval air display we have so far seen.

There was also an exceedingly well-stocked static exhibition and many working models which were almost as absorbing as the flying itself; and the visitors showed their appreciation by staying well on into the evening to inspect them. There were also competitions, cinema shows, joy-riding, and even (as is now customary on these Naval occasions) a thoughtfully provided nursery for the children. H.M.S. *Peregrine's* aviation display had something of interest for all tastes and ages, and every sailor on the station proved himself a genial host. It's a way they have in the Navy . . .

For Fuel Economy and Control
at All Altitudes



DOWTY

SPECIALISTS IN
SPILL CONTROL FUEL SYSTEMS

GLOSTER RECOMMEND
Castrol

HERE AND THERE

NOSEY: Developed specifically for high-altitude photographic reconnaissance, this carrier-borne McDonnell F2H-2P Banshee is characterized by a proboscis which might well be envied by a certain film comedian. It houses six cameras, in which conventional, colour, or camouflage-detecting film may be used.

Jet Race in France

EIGHT French Air Force Vampires competed in the Paris-Cannes race held in connection with the Cannes air display last week-end; the winner, in 51 min 28 sec, was Capt. R. Sarrabayouse. Four R.A.F. Meteors of No. 43 Squadron ("The Fighting Cocks") gave an aerobatic show during the display.

Mr. Eden at Lockheeds

DURING his recent North American tour Mr. Anthony Eden visited the Lockheed factories in Los Angeles. Among the aircraft he inspected was the 180-passenger Constitution, now flying with the U.S. Navy and temporarily at the works for servicing.

171 goes into 170

WHEN the fourth Bristol Freighter to be delivered to the Royal Australian Air Force left Lyneham on August 29th it carried in its hold a Bristol 171 helicopter destined for service with the R.A.A.F. at Woomera. Rotor blades and head were loaded separately, and the Freighter's hold comfortably received the 42 ft-long helicopter fuselage.

Last Lap

THE "transatlantic" Canberra arrived at the Glenn Martin Baltimore airfield on September 4th after covering the 1,125 miles from Gander, Newfoundland, in 2 hr 51 min. W/C. Beamont and his crew had been weather-bound at Gander for three days. It is reported, incidentally, that final arrangements have been completed whereby the Hudson Motor Car Company of Detroit will act as sub-contractors to Glenn Martin for complete rear fuselage and tail units of the Canberras which the Baltimore company is building.

JUNIOR SITS-IN: Young Charles Masefield samples the controls of the Elizabethen flagship while his father, B.E.A.'s chief executive, tries the comfort of the cabin after trying-out the aircraft himself in "circuits and bumps" and simulated engine-cuts.

Earlier Jubilee Ball

THE date of the Jubilee Ball of the Royal Aero Club has been put forward from October 31st to October 24th. Tickets are being sold to members and associate members, who may obtain them for their friends. Londonderry House will be the setting for the ball.

Clearing the Line

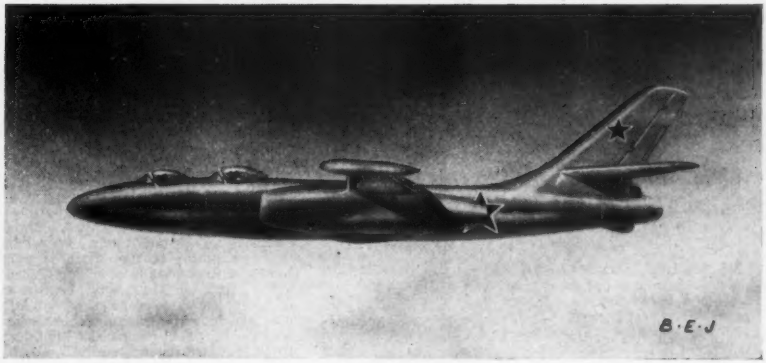
IN Ohio, the use of light aircraft for protecting crops has moved on to the next stage of development, for experiments are being conducted with a Piper Super Cub to kill offending shrubbery. The aircraft has been arranged to spray a poisonous solution on foliage that threatens to foul overhead power lines.

In Black and White

WORLD records now announced as having received F.A.I. confirmation include a straight-line-distance attempt in Class C.1a (aeroplanes up to 500 kg) by M. Albert Rebillon, who on July 25th flew a Minicab GY-20 (65 h.p. Continental) from Toussus-le-Noble, Paris, to Rabat, Morocco, a distance of 1,826.9 km or 1,135 miles. Another was Capt. Jan Christie's Class C.1b (500-1,000 kg) record: on May 24th, from Stockholm, he flew his Hirth-engined Klemm round a 2,000-km closed circuit at 177.786 km/hr, or 110.48 m.p.h.

New Zealand Race News

THE Canterbury International Air Race Council intends to invite His Majesty the King to start the 1953 England to New Zealand Race. The Council's president and vice-president, Mr. H. D. Christie and Mr. J. S. W. Stannage, are to visit the



TRAINER VARIANT of the Russian twin-jet bomber, now operational in Germany, is depicted in this new drawing. Among features shown are the location of the second pilot's enclosure, the wing-tip fuel tanks, and the nacelles of the Nene-type turbojets.

HERE AND THERE...

United States in November to build up American interest and participation. To be held round about October 10th, 1953, during the Christchurch International Exhibition, the contest will be for two first prizes of £10,000 sterling (in "speed" and "transport handicap" races respectively), and others of £3,000, £1,000 and £500.

More Accurately

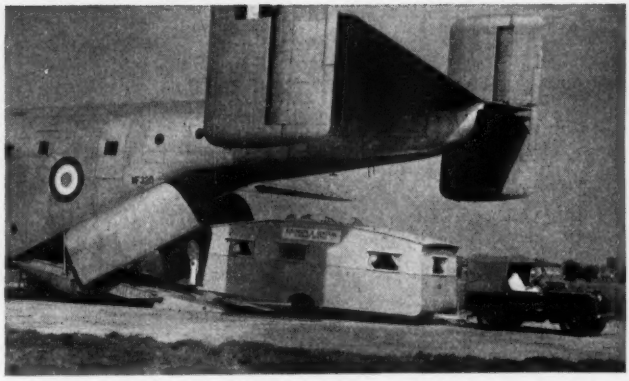
FOLLOWING the inquest on D. J. P. Broomfield, who lost his life in the recent accident to the H.P.88, Mr. B. A. Morris (Senior Investigating Officer, Accident Investigation Branch, M.C.A.) was quoted by a news agency as saying that "a failure of the construction of the aircraft had occurred." We are now officially informed that (as we suspected was the case) his actual words were "a failure of the *structure* had occurred."

The Next Step

IT was announced in Washington last week that an order had been placed, with Consolidated Vultee, for the development of an aircraft which is to have nuclear power. The contract is principally for the airframe, an order for the development of the power unit having been given to General Electric last February. No quick results are expected, for the design-problem is formidable, one of the principal difficulties being the weight of the necessary protective shielding. As long ago as early 1947 a study-group was formed at Oakridge, Tennessee, to investigate the possibilities of project NEPA (nuclear energy for propulsion of aircraft).

The Hard Way Home

IN a recent article in *Flight* ("Canada's Arctic Air Services," August 17th) reference was made to the initiative always demanded of the "bush pilots" who operate in the Canadian Far North. The fact was underlined last week by the news that a note has been found in the cockpit of a wrecked aircraft of Yellowknife Airways, first spotted on the shore of Wholadai Lake by a U.S.A.F. B-29. Written by the pilot, John Bourassa, who disappeared four months ago while flying from Bathurst Inlet, on the Arctic Sea, to a mine 200 miles south, it said that he was unhurt and intended walking 200 miles to Fort Reliance, on the Great Slave Lake. He had a tent, rations and a rifle, and his employers are confident he will find his way back.



CARAVANSERAI: Load of the Blackburn and General Aircraft G.A.L.60 (Universal Freighter) for the S.B.A.C. Display is a 22ft caravan, towed by a Land Rover. That eminently practical pilot, "Tim" Wood, announced his intention of flying from Brough to Farnborough at great heights, and with the heaters off, in order that the refreshing beverages in the caravan should arrive well iced.

MR. ARTHUR B. BOURNE, who, as we announced last week, is appointed a director of Iliffe and Sons, Ltd., proprietors of "Flight."

Modern Fuels

IN a reference last week (in connection with the Napier Nomad compounded design) to fuels for diesel and other engines, a condensation of sentences may have caused misunderstanding. C.I. (Compression-ignition, not I.C. as printed) engines of relatively high operating speed normally use a refined fuel oil known as Derv (Diesel Engine Road Vehicle); larger stationary and marine engines use various heavier fuel oils, including gas oil. Some tractors use P.B.O. or a variant, T.V.O. (Tractor Vaporizing Oil), and for these an ignition system is employed. P.B.O. is, in fact, normal Pool Burning Oil of the paraffin (or kerosene) type as used also for aircraft gas turbines.

Egypt's New Gliding Movement

FOR the new Gliding Institute of Egypt, promoted by the Royal Egyptian Aero Club, five gliders have been ordered from Britain, and Mr. R. G. Swain, well known as a sailplane pilot in this country, has been appointed chief instructor. A big air display will mark the inauguration of the Institute in November.

IN BRIEF

ROTOL, LTD., announce that Lt. Gen. Sir John Evetts, C.B., C.B.E., M.C., has been elected to the Board and appointed Managing Director.

* * *

In our industry directory last week, under the heading "Parachutes, Dinghies and Special Equipment", cross-reference should have been made to the products of R.F.D., Ltd., dealt with on page 323 ("Auxiliary Services") and 333 ("Military-aircraft Special Equipment").

* * *

Of the ten candidates who passed completely in all four subjects of Part 1 of the R.Ae.S. Examination in May last, five came from the Chelsea College of Aeronautical and Automobile Engineering.

Rumbold and Co., Ltd., announce that W/C. N. M. S. Russell has resigned his position as sales manager, and that sales enquiries should be addressed to the company (Kingsgate Place, London, N.W.6).

* * *

During its recent transatlantic flight the Canberra (which was Marconi-equipped for both communication and navigation) sent progress-messages to the G.P.O. station at Portishead, which is also Marconi equipped; and the Canberra's radio-operator, R. H. T. Rylands, is one of the Chelmsford company's engineers.

* * *

An invitation has been extended to British machine-tool manufacturers to exhibit their equipment at the Ninth Biennial Industrial Exposition to be held in Chicago from March 17th to 22nd next year. Inquiries should be addressed to the A.S.T.E. Industrial Exposition, American Society of Tool Engineers Building, 10700 Puritan Avenue, Detroit, U.S.A.

MR. C. H. SMITH (left), chief designer to Flight Refuelling, Ltd., has recently left to take up a similar appointment with their U.S. associates, Flight Refuelling, Ltd., Danbury, Conn.

MR. S. BOWIE, B.Sc., M.I.Mech.E., M.I.Mar.E. (right) has joined the staff of R. B. Pullin and Co., Ltd., as chief development engineer. He was formerly with the M.o.S. and later in the R.N. Scientific Service.

FOUR NEW

TIME - TO - ALTITUDE

RECORDS

CREATED BY

ARMSTRONG SIDDELEY

SAPPHIRE Jet Engines★

3,000 *metres*	(9,842.5 *ft*)	—	1 *min* 16 *secs*
6,000 *metres*	(19,685 *ft*)	—	1 *min* 50 *secs*
9,000 *metres*	(29,527.5 *ft*)	—	2 *min* 25 *secs*
12,000 *metres*	(39,370 *ft*)	—	3 *min* 7 *secs*

(*Subject to official confirmation*)

★ The Armstrong Siddeley Sapphire is the most powerful jet engine in the world. It is to be produced both in the United States of America and in Great Britain in large quantities for the latest types of military aircraft. The Gloster Meteor aircraft with which the records were established on 31st August, 1951 is another product of the Hawker Siddeley Group. The installation of the two Sapphire engines was carried out by the Aircraft Division of Air Service Training Ltd., a third member of the group.

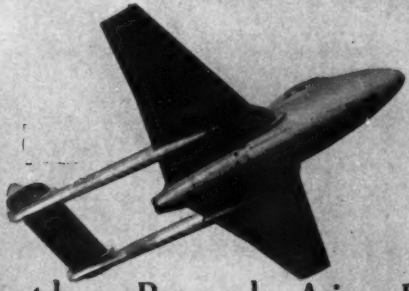
ARMSTRONG SIDDELEY MOTORS LTD.

COVENTRY

Member of the Hawker Siddeley Group

VAMPIRE *all-purpose jet* TRAINER

in quantity production



for the Royal Air Force

DE HAVILLAND

Wings, power plant installation and fixed landing gear are all commendably neat on the Provost. The cockpit enclosure, however, though functionally adequate is not entirely in keeping.

PERCIVAL PROVOST In the Air

Flying Experience with the R.A.F.'s Latest Basic Trainer

NO. 45 OF THIS SERIES By THE EDITOR

IT is a pleasure, but also a big responsibility, to write personal notes on handling a newly adopted trainer. The pleasure is identified with the fact that trainers usually fly very nicely and you can do almost anything with them. The extra responsibility is involved because a large number of experienced instructors and an even larger number of pupils will subsequently fly the machine; it is very important not to mislead them over a single point, if only for fear of being shot down in a big way when, having had time to know the aircraft well, they find that impressions formed during a few flights in prototypes and written down for use in evidence do not accord in every case with their own.

The following impressions are personal ones, and are, frankly, favourable. To make my position quite clear, I should add that I favour the basic specification and, after having instructed in many different types, believe in side-by-side seating at this stage. The Percival Provost gives the lie to one argument put forward by the pro-tandem-seating diehards, namely, that bulky cockpit will ruin performance. Now that a more generous stable is permitted in the nose of an R.A.F. basic trainer, the argument does not apply and, in fact, the Provost (or P.56 Mk 2) has a pleasing turn of performance on the 550 h.p. of its Alvis Leonides 25.

A feature of many American aircraft is their beautifully formed bubble canopies—even to cover large trainer cockpits. In this country we still seem to be thinking in terms of greenhouse construction for non-operational types.

A full description, with large cutaway drawing, introduced the constructional details of Percival's latest trainer in our issue of May 4th last, so little will be added here on that subject. The cockpit layout illustrated at that time is almost exactly as approved for production machines. The main point of difference lies in the central pedestal, upon which power and pitch levers are mounted in preference to separate levers on the two cockpit sides. The port side pair of levers are retained and the pupil can thus choose which hand he uses.

Both the Mk 1 with Cheetah engine and the Mk 2 with Leonides have completed tropical trials, and Boscombe gave the Mk 1 their customary complete work-out some months ago. The Mk 2 is undergoing further testing at present. The additional 130 h.p. of the Leonides probably affects most of the handling characteristics favourably. The rate of climb for getting to aerobatic and spinning height will be something the instructors in Training Command have longed for, and the power is useful for going up on manœuvres such as rolls-off. For ordinary circuits and general flying it may be regarded as excessive. For take-off instruction the patter will have to be reduced to about a dozen words of one syllable, otherwise the bit about "gentle backward pressure on the control column causing the aircraft to leave the ground" will be going over the intercom at 500ft. Admittedly the instructor does not have to use full power for take-off. Perhaps some form of gated throttle may provide a solution, for it would be a pity to deprive the aircraft of some of its power on other occasions.

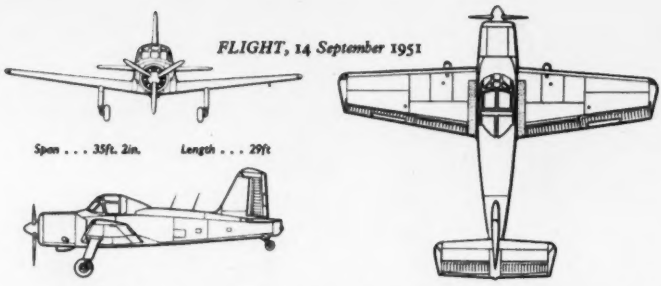
Before passing on to flying characteristics, the Provost's place in the latest training picture may be mentioned. As a basic aircraft which is, nevertheless, as "advanced" as the Harvard, it can look after flying training from *ab initio* to well into the applied syllabus, and eventually may hand over to an intermediate jet trainer (our leading articles of August 24th touched on these matters). The jet trainer would then carry a pilot through to the operational conversion stage—one short hop from the squadron. Events have moved faster than design and production of most types of trainer. The sooner something on the lines of the projected Boulton-Paul P.119 intermediate jet trainer can be produced, the better.

As a direct replacement for the Prentice, the Provost has sufficient additional levers and dials to appear complicated to a new pupil, who most likely will not have flown before or who at best will have had an hour or two in an elementary type. However, there is a straightforwardness about everything, particularly the flying controls, that should help him to acquire the necessary confidence at an early stage. He should see well and find the instruments grouped in a logical manner. For the first and perhaps the only time, he will have to learn to play with oil-cooler controls.

Most of the levers, trimmers and buttons will be found on

PERCIVAL PROVOST

In the Air . . .



The Provost's excellent proportions, as illustrated in these general-arrangement drawings, offset the unavoidable angularity of a design incorporating a large side-by-side cockpit.

the pedestal, the blind-flying panels straight ahead of each seat, and the engine instruments positioned centrally on the main panel. The brakes are operated from the stick, and a single lever on the port-side cockpit wall engages a lock on the flying controls—a neat device.

On starting-up, one of the first things I noticed was the smoothness of the Leonides. Even when cold this nine-cylinder radial ticks over without vibration. Normal procedure is followed for starting, and warming-up speed is about 1,100 r.p.m. Magnetos are checked at 2,600 r.p.m. and zero boost, and airscrew pitch change from 2,200 r.p.m. in full fine. A full-power check, if needed, should give 3,000 r.p.m. and +8 lb/sq in. The noise level in the cockpit is pleasantly low.

The take-off check accords with the standard initials, and trimmers are both set to neutral. In the case of the rudder this may be a matter of how the control wheels are attached, and a glance back at the tab gives the answer. As a fair amount of use needs to be made of rudder trim on the Provost, it may be better to have the neutral-indicated position for normal cruise, with some bias shown for take-off. In practice, the aircraft has little or no tendency to swing; the throttle may be banged open, whereupon one is airborne in under 150 yd, the firm push in the back being maintained right into the climb. The stick is quite sensitive as soon as the aircraft gets under way, and a little care is needed to avoid getting the tail too high and so bringing the airscrew blade tips too near the ground. This applies particularly at rough grass fields, like Luton.

Initial (maximum) rate of climb is 2,000ft/min, and at climbing power it is 1,500ft/min. The aircraft flies off from the slightly tail-down take-off run and maintains a similar attitude during the climb, there being little or no fore-and-aft trim change on reducing power and revs or upon raising the flaps from the take-off position. Changes of speed and attitude do call for some rudder-trim adjustment, but the foot loads concerned are light.

A variety of cruising conditions are available to the pilot, and something between 2,400 and 2,600 r.p.m. with zero to +2 lb of boost seems to give a comfortable performance. Considerably lower boost and r.p.m. may be used for most economical cruising without the Leonides losing any of its smoothness.

The Provost trims well for hands-off flying, and there is a strong (sideways) self-centring action of the stick. Fore and aft it is stable; laterally, no more than neutrally stable, that is to say, a wing stays more or less where it is put without attempting to come back to the level position (allowance being made for secondary reactions).

As soon as I had gained sufficient height and got clear of cloud I tried out the stall. On a previous occasion I had flown Provost WE530 (as illustrated) with spoiler strips fitted on the wing-root leading edges, and these are now standard fixtures. On the flight here described, the aircraft was the tropical-trial machine without these strips, so a comparison of the stall characteristics of the two was therefore possible. With flaps up the stalling speed is indicated as just over 60 kt; with them down, the critical figure is about 55 kt.

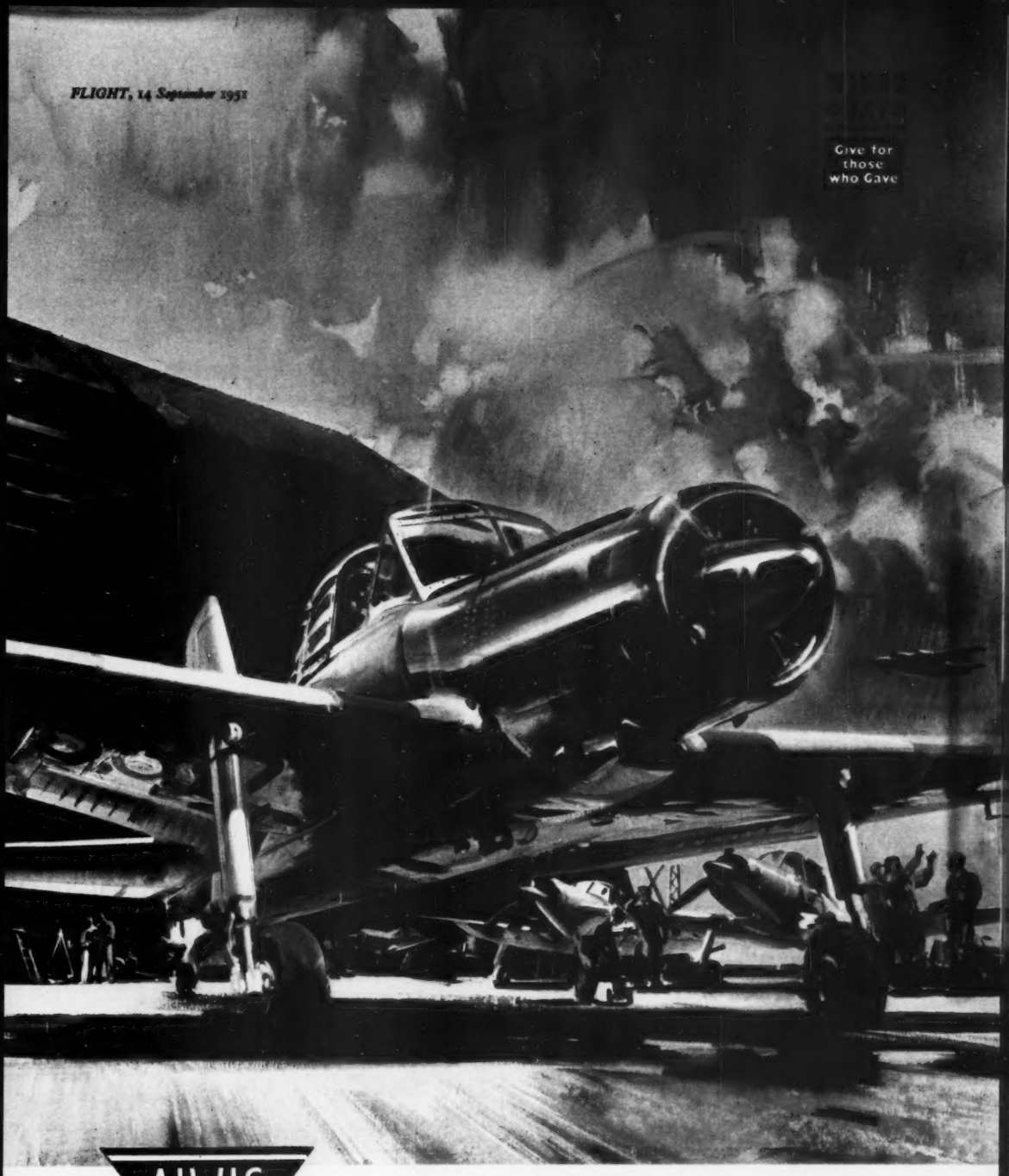
There is, in fact, little difference in the actual stall with flaps up, at take-off position, or down; nor do the strips seem to affect it. They do, however, achieve the intended result of giving the necessary stall warning. It is not very great—just a slight buffeting about 5 kt before the gentle, straight drop of the nose, which is followed in turn by the starboard wing going down. Rudder does not readily pick up the right wing in the stall; with flaps down there seems to be less warning than with them up; without knife-edges there is virtually no warning. Recovery is immediate if the controls are centralized. A considerable stick-pull from trimmed normal flight is required to stall the Provost, which in general may be described as docile and conventional in behaviour at the stall.

Stalls off a climbing or gliding turn are just as gentle, and even if the aircraft is flown intentionally with stick back and outwards and ruddered into the turns—typical ham-pupil tactics—the incipient spin is very slow to develop and recovery is quick and easy. With full flap a sort of spiral dive may start to develop.

In steep turns, if the stick is pulled well back and g is increased (I am told the figure is just under 3g) the Provost can be made to flick crisply out—always to starboard—the feeling being very like that experienced under similar conditions on, for example, the Harvard.

From 5,000ft I tried several spins and found these, too, to be appropriate to a trainer. Depending on how you enter it, the first turn or two may be rather erratic, but after that the aircraft settles down into a fairly flat, smooth spin, with medium rate of turn. A safe estimate of height lost is 1,000ft per turn. If a little opposite aileron is applied (as it often is unconsciously) a pronounced pitching develops. To enter the spin or stay in it, the stick needs to be right back (it stays there once you are spinning) and full rudder applied. For recovery, the stick must be pushed forward with medium to high force behind it, and plenty of, if not full, opposite rudder applied. The spin seems to tighten and speed up for about a turn; then the aircraft comes out quickly with nose well down. Unless rudder is centralized immediately at this point a rather uncomfortable amount of slip occurs. Spins to the left seem to steady up more than

Ready for take off—the tail should be raised only slightly, and the Provost flies off quite happily in its ground attitude.



ALVIS

ALVIS LEONIDES

Chosen after competitive trials to power the Percival P.56 "Provost" the new basic trainer for the Royal Air Force

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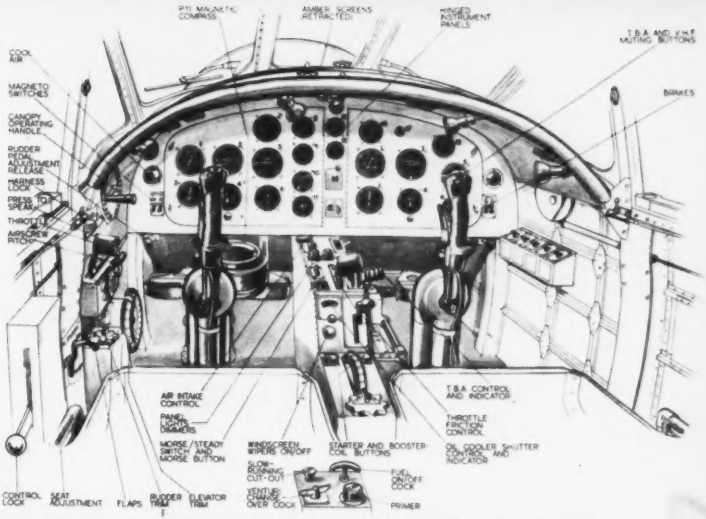
PERCIVAL PROVOST

In the Air . . .

The well-arranged cockpit of the production Provost allows plenty of elbow-room for instructor and pupil, and an excellent field of view.



1. Air-speed indicator
2. Altimeter
3. Artificial horizon
4. Directional gyro
5. Rate of climb
6. Turn and slip
7. Tachometer
8. Boost
9. Oil temperature
10. Oil pressure
11. Clock
12. Fuel gauge
13. Cylinder-head temperature
14. V.H.F. control
15. Pitot head heat
16. Air-bottle pressure
17. Power-failure warning
18. Vacuum gauge

those to the right. A fairly good idea of stalls and spins having been obtained, aerobatics seemed to be an appropriate item for next place on the list. There was a time when I used to do a "nice easy" loop first of all and leave the "nasty difficult" slow rolls until the end. Nowadays, with new aircraft, it is the complete reverse, and a nice easy roll comes first. The Provost will go round slowly or fast, barrelled or straight, with the minimum of effort on the pilot's part—just stick over, and a bit of top rudder coming out. The speed should be not less than 130 kt. The ailerons can be used to their full extent to produce a four-second full roll.

Loops will need some practice before a pupil will be sure of getting them just right. The speed going in should be about 160-170 kt and r.p.m. are better stepped up a bit. A fair pull is needed at first to get the Provost going up, but after that it is a matter of feeling the aircraft over the top, otherwise she may stall or half-roll out to starboard. These symptoms are, of course, familiar and harmless enough, though not hitherto found to the same extent in elementary or basic designs. Care is also needed to keep quite straight, even if the stick is handled correctly.

Remarks about loops also apply in the main to rolls off the top. The speed needs to be about 190 kt, but even if it gets very slow on top, the ailerons will roll you out quite nicely either way, and the rudder remains effective while coming out.

It seems certain that flying schools will like aerobatics in the Provost, will consider them good from the training viewpoint and will appreciate the power to enable aerobatic height to be gained quickly and held during the practices.

On the way down to the circuit I dived to an indicated 220 kt and noted that there is much less tightening of controls than might be expected. Both ailerons and elevators remain comparatively light. Maximum dive speed is given as 250 kt, but a steep dive with power would be needed to reach it. I have not so far commented on the individual controls, but may add here that they are well harmonized, suitably but not too light, and the ailerons in particular are pleasant and effective up to their full range of movement and at all normal speeds. Accurate medium turns can be made with ailerons only, but with rudder used alone a skidding flat turn results, hardly any bank developing.

Circuits and landings are pleasant to make. The view is very good, the changes of trim with flap negligible, the approach characteristics comfortable and the touch-down gentle. Circuit speed is a matter of choice, but by the final cross-wind leg 105 kt seems to be a natural speed and take-off flap (speed limitation, 129 kt) is selected. After turn on to finals, full flap is lowered at about 85 kt and the descent then becomes fairly steep unless quite a lot of power is used. Over the boundary the speed can safely be allowed to fall to 75 kt. In fact, lower speeds can be used, but there seems to be no particular virtue in them, for the Provost has very little float before round-out and it was my impression that it approaches and holds off better with the extra 5 kt.

A very nice glide approach and landing can be made at about 80 kt and—what is now rather unusual—the Provost side-slips well. A long slipping turn approach reminiscent of the pre-war Auxiliary Hart days is a pleasure to execute. It is as well to come out in plenty of time to steady up for the landing. On holding off there is little tendency to balloon, but a slight float with tail down. The elevators remain powerful and care must be taken not to land tail first. The three-point touch-down is simple and solid, and the smooth and powerful brakes can safely be used on the run.

If an overshoot is necessary the Provost has plenty of power to climb away with full flap at a speed of about 90 kt, and when this and a safe height of 200-300 ft is reached, flaps can be raised with little sink. As flap comes up there is a slight nose-down trim change. Both trimmers are sensitive and powerful.

The Provost can be flown with hood open (I understand Boscombe have spun it in this condition) but it is rather a rough ride, due to bufleting. In rain, forward view is nil unless the windscreen wipers are used, but sideways (for formation flying) it is very good. The low noise-level, already mentioned, coupled with good intercom, will ease the strain on both pupil and instructor.

Because of its docile, according-to-the-book behavour *ab initio* pupils should quickly settle down with the Provost, even though there is more of it than has been customary with first instructional machines in the past. There seems to be no doubt, in fact, that R.A.F. Training Command will receive in their new basic trainer an aircraft most likely among all others to date to find favour with instructors, pupils and ground crews alike.

DATA FOR THE PERCIVAL PROVOST BASIC TRAINER

	P.56 Mk. 1 (Armstrong Siddeley Cheetah 18)	P.56 Mk. 2 (Alvis Leonides Mk. 25)
Performance:—		
Take-off power	420 h.p.	540/560 h.p.
Max. power	430 h.p. at 2,500ft	570 h.p. at 1,750ft
Max. continuous power	320 h.p. at 5,000ft	450 h.p. at 7,000ft
Max. weak-mixture power	280 h.p. at 7,000ft	330 h.p. at 11,000ft
Max. climb power	385 h.p. at 3,500ft	450 h.p. at 7,000ft
Fuel consumption (max. power)	41 gall/hr	57 gall/hr
(max. w.m. cruise)	17 gall/hr	21 gall/hr
Max. speed at 2,500ft	154 kt	174 kt
Max. cont. cruise at 2,000ft	132 kt	155 kt
Max. weak cruise at 5,000ft	128 kt	141 kt
Stalling speed (flaps down)	58 kt	
Initial rate of climb (t.o. power)	1,270ft/min	2,200 ft/min
(climb power)	1,020 ft/min	1,505 ft/min
Rate of climb at 5,000ft	920 ft/min	1,560 ft/min
Time to 5,000ft	5 min	3.3 min
Time to 10,000ft	11.7 min	6.5 min
Service ceiling	16,500ft	25,000ft
Take-off (ground run)	230 yd	140 yd
Take-off (to 50ft height)	460 yd	290 yd
Landing (from 50ft height)	630 yd	650 yd
Landing (ground run)	380 yd	380 yd
Range (max. w.m. at 5,000ft)	450 n.m.	443 n.m.
Range (max.)	480 n.m.	573 n.m.
Dimensions:—		
Span	35ft 2in	
Length (flying attitude)	28ft. 5¼in	29ft.
Height (flying attitude)		12ft 0¾in
Ground angle		9½ degrees
Wheel base		20ft 9¼in
Track		11ft 1¾in
Wing area		214 sq ft
Aspect ratio		5.78
Wing incidence		3 degrees
Dihedral		6 degrees
Flap area (each)		9.47 sq ft
Weights and loadings:—		
Structure	1,304 lb	
Power plant	1,205 lb	1,242 lb
Tanks and piping	139 lb	
Equipment—electrics, radio, seats, etc.	500 lb	
Miscellaneous	127 lb	136 lb
Crew	400 lb	
Fuel and oil (66 gal fuel)	525 lb	529 lb
All-up weight	4,200 lb	4,250 lb
Wing loading	19.64 lb/sq ft	19.85 lb/sq ft
Power loading	10 lb/b.h.p.	7.7 lb/b.h.p.

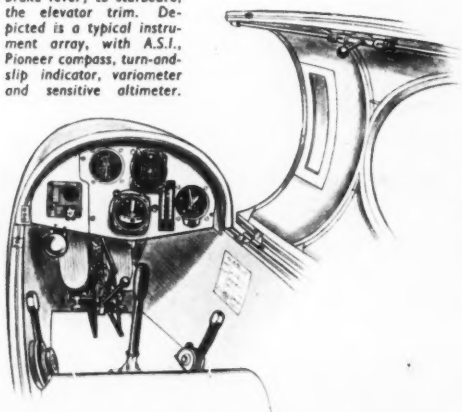
SLINGSBY SKY

Structure and Equipment of the New British Sailplane that has Successfully Challenged the Weihe

Span .... 59 ft.
BAROGRAPH STOWAGE
FIVE-PIN WIR ATTACHMEN (SEE SEPARA
BIRCH-PLY SKIN TO MAIN AND DIAGONAL SPAR. FABRIC AFT
AEROFOIL SECTION GÖTTINGEN 549 AT ROOT TO MODIFIED N.A.C.A.2R12 AT TIP
OXYGEN BOTTLE AND ECONOMISER
COCKPIT
1. ELEVATOR TRIM
2. DIVE-BRAKE CONTROL
3. RUDDER PEDAL ADJUSTMENT
4. CANOPY HINGE-LINE
DAYLIGHT APERTURE TO INSTRUMENTS
VARIOMETER FLASK
RUBBER-SPRUNG SKID
PRESSURE TUBE TO A.S.I. (STATIC OPEN TO COCKPIT)
FRONT (AERO) AND REAR (WINCH) TOWING POINTS (5. CABLES TO QUICK-RELEASE)
OPERATION ELEVATOR AILERONS

THE recent National Gliding Contests are generally agreed to have shown conclusively that the gliding movement in this country now has a high-performance sailplane of all-British design which will stand up to competition from the best foreign types. The prototype of this aircraft, the Slingsby Sky, first flew almost exactly a year ago. It is designed as a high-performance contest sailplane, and from the start the makers have intended that it should outfly any foreign machines of a similar class. That their object has been achieved is shown by the Contest results, in which the two Skys took first and second place, followed—seventy points behind—by German Weihe sailplanes in third and fourth places. For several years past, both the British Nationals and the International Gliding contests have been won by Weihes, which have come to be regarded as the standard by which any high-performance sailplane may be judged.

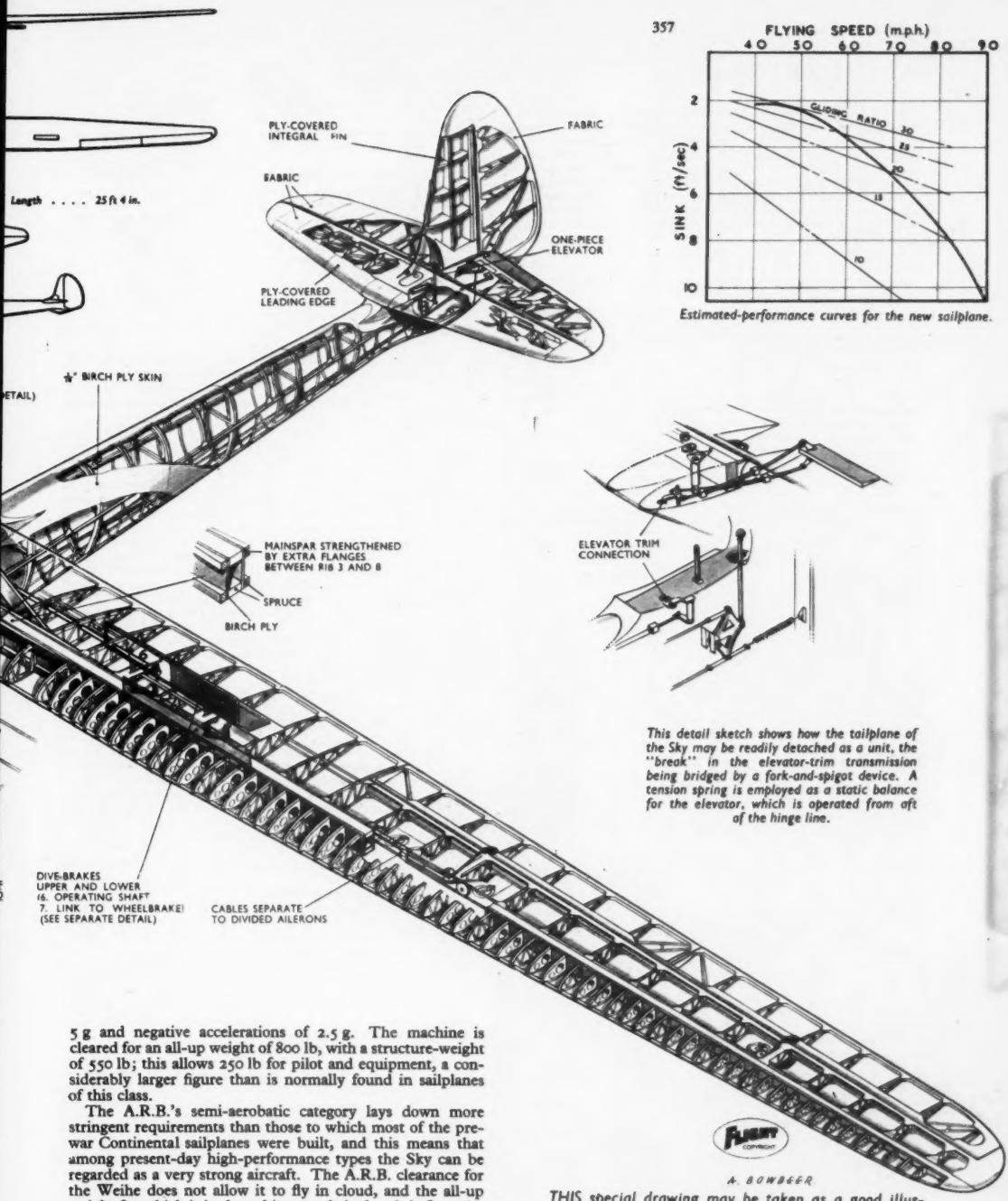
The appearance of the Sky marked the virtual fulfilment of Slingsby Sailplanes' post-war design programme, and it is interesting to note the many points of similarity between this and other types produced by the firm. The Sky is a direct development of the Gull IV and Kite II, both sailplanes designed by the firm since the war. The Gull IV, of fifteen-metre span, was developed for the 1948 International Gliding Contests. In so far as it went, the machine was considered to be a success, but after the 1948 event it was obvious that a sailplane which was required to stand up to the competition of the larger foreign craft would have to be of at least eighteen-metre span. It was, therefore, decided to develop the Gull into an eighteen-metre sailplane; the soundness of this decision was soon to be demonstrated by the results obtained.



The flying controls are conventional. Rudder pedals are adjustable by a central lever. To port is the dive-brake lever; to starboard, the elevator trim. Depicted is a typical instrument array, with A.S.I., Pioneer compass, turn-and-slip indicator, variometer and sensitive altimeter.

Apart from the increased span, the resultant increase in aspect ratio, and an 18-in increase in the length of the rear fuselage, the Sky can be said to be aerodynamically identical with the Gull IV. The wing sections are exactly as on the Gull. The increase in span was obtained by adding two extra rib bays to the parallel part of the wing on each side of the fuselage, and by increasing the rib spacing over the tapered portion by two inches for each bay. The ailerons, also, had to be increased in size accordingly.

It is on the structural side that the main differences between the Sky and Gull IV are to be found. The structure of the Sky is designed to meet the Air Registration Board's semi-aerobatic category. This calls for overall reserve factors of 1.5 when the machine is subject to positive acceleration of



Estimated-performance curves for the new sailplane.

This detail sketch shows how the tailplane of the Sky may be readily detached as a unit, the "break" in the elevator-trim transmission being bridged by a fork-and-spigot device. A tension spring is employed as a static balance for the elevator, which is operated from aft of the hinge line.

5 g and negative accelerations of 2.5 g. The machine is cleared for an all-up weight of 800 lb, with a structure-weight of 550 lb; this allows 250 lb for pilot and equipment, a considerably larger figure than is normally found in sailplanes of this class.

The A.R.B.'s semi-aerobatic category lays down more stringent requirements than those to which most of the pre-war Continental sailplanes were built, and this means that among present-day high-performance types the Sky can be regarded as a very strong aircraft. The A.R.B. clearance for the Weihe does not allow it to fly in cloud, and the all-up weight for which it is cleared is exceeded when it is flown by a heavy pilot.

The structure of the Sky is of wood, spruce being used for all stressed members and birch ply for gussets, webs and skins.

The cockpit is built to a standard pattern developed by

FLIGHT COPYRIGHT

A. BOWDLER

THIS special drawing may be taken as a good illustration of ultra-modern sailplane design and equipment. Of particular interest is the internal structure of the high-aspect-ratio wing. Performance curves are given above, and a data table will be found on page 359.

SLINGSBY SKY . . .

Slingsby since the war, the firm having gone to great lengths in investigating the most satisfactory arrangement of controls and instruments, and the most comfortable seating position for the pilot. The Sky's cockpit is, accordingly, identical with that of the Gull IV and Kite II, and is, in fact, built on the same jigs.

Arrangement of the flying controls follows normal practice. The control column rises from a canvas sleeve in the floor and is conveniently placed for most sizes of pilots. The rudder pedals are hinged at the bottom and can be adjusted for position while the aircraft is in flight. The adjustment is effected by movement of a lever which releases a lock; the pedals can then be moved to the required position with the feet. This arrangement, identical with that used on certain German sailplanes, relieves the pilot of considerable fatigue on long flights.

The quick-release control is placed on the port side of the cockpit under the instrument panel and consists of the usual yellow knob; this one control operates both front and rear towing releases. The releases themselves are of the Ottfur pattern, which automatically drops the cable when it exceeds a certain angle to the aircraft, thus avoiding the danger of a pilot forgetting to release.

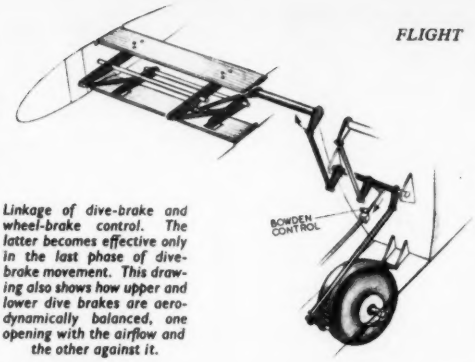
The dive-brake operating lever is positioned on the port side just in front of the seat and is pulled back to open the brakes. When a landing wheel is fitted, the last part of this movement is also used to operate the wheel brake. The elevator trimming lever is located in a complementary position on the starboard side.

The question of instruments and similar equipment is left to be decided by the customer, the weight allowance being sufficient to cater for the most luxurious taste. To date the weight of equipment called for has varied from 11lb (in the case of Forbes' aircraft in the National Contests) to a maximum of 70 lb which included 25 lb of batteries, a rotary converter and an oxygen installation consisting of bottle, regulator and economizer. With all this there was still a sufficient reserve of weight to allow for the installation of radio at a future date.

Particular attention was paid in the early stages of the design to ensure that the maximum amount of space was available for stowage of equipment. The centres of the main bulkheads are so designed as to allow access to a large part of the interior of the fuselage when the parachute box in the cockpit is removed. A small stowage compartment is also located in the neck of the fuselage, and it is here that the barographs and other small items of equipment will normally be carried. Although no installations have yet been designed, water ballast tanks could be installed in the fuselage. (These are sometimes carried to increase all-up weight, and hence the cruising speed, at times of the day when thermals are very strong; the water can be jettisoned when the thermals become weaker.)

The fuselage aft of the cockpit is of semi-monocoque construction and consists of light frames interspaced with stiffening members. Three longitudinal stringers run the length of the rear fuselage, and are supplemented by two further stringers in the region of the wheel bay. The whole of the rear fuselage is covered with a skin of $\frac{1}{16}$in plywood.

The tail unit, with the exception of the rudder, consists of standard parts as used in the Gull IV. Originally the Gull rudder, also was employed, but was found to be slightly inadequate in area, so a larger surface with a nose balance was designed to replace it. For transport it is necessary to remove the tailplane and elevator, and to facilitate this operation the attachments are so designed that removal of one nut will effect release.



Linkage of dive-brake and wheel-brake control. The latter becomes effective only in the last phase of dive-brake movement. This drawing also shows how upper and lower dive brakes are aerodynamically balanced, one opening with the airflow and the other against it.

It is probably in the wing that the most interesting structural details are found. Of 59ft span, it has an aspect ratio of 18.7, which is higher than any previously used by constructors in this country. The proportions of the wing necessitate massive main spars, and their weight alone accounts for 25 per cent of the structure-weight of the aircraft. The spars are of box construction and reach a maximum width of 6in at a point 5ft from the fuselage. The root-attachment fittings are of the three-pin type, and the top booms unite on the centre line of the aircraft, the bottom booms picking up on each side of the fuselage attachment fitting.

To meet the torsional-stiffness requirements laid down by the A.R.B. it was necessary that a moment of 100 ft-lb applied at mid-aileron span should not deflect the wing more than 40 minutes of arc. This necessitated a very stiff wing. The main spar is positioned at 30 per cent chord, and the area forward of this forms a torsion box that is covered with diagonal-grain plywood, 2 mm thick at the root and tapering to 1 mm at the tip. Stiffening is provided by closely spaced nose ribs, 140 of which are used in the full span of the wing.

Each aileron, 16ft long, is divided into two separately controlled sections. This prevents the aileron controls stiffening up when the wing flexes under load, for wings of this type may deflect as much as three feet at the tip when subjected to turbulent-air gusts. To overcome the problem of excessive stretch in the aileron control system, high-tensile-steel rods, operating in tension, are used in place of the usual cables. The aileron system, as indeed are all the controls, is designed to operate satisfactorily at any temperature likely to be encountered at heights between sea level and 40,000ft.

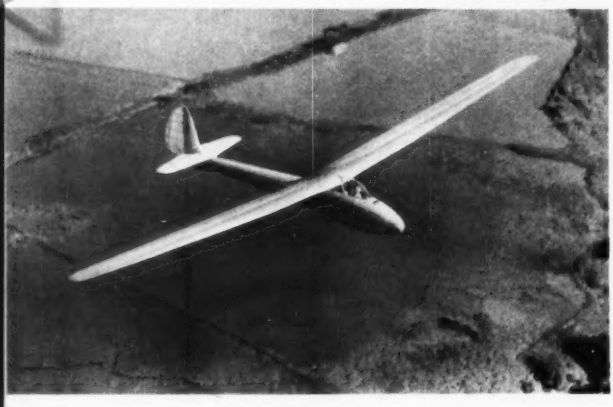
The dive brakes are located in the wings at points 9ft out from the fuselage. They are of an aerodynamically balanced type which open direct into the airflow. The movement of the bottom brake, which opens with the flow, assists that of the top brake, which opens against the flow.

At an early stage in the design the feasibility of incorporating a de-icing system was investigated; consideration of cost and weight, however, were found to make the idea impracticable. It was, alternatively decided to spread de-icing fluid on the appropriate surfaces, and if pilots followed the normal practice of periodically moving the flying controls when flying in icing conditions, the aircraft would be unaffected by most conditions likely to be encountered. The Sky flown by Stephenson in the National Contest encountered icing in a climb through cloud to 15,000 ft. Thick hoar-frost formed on the aircraft but the functioning of the controls was unimpaired.

To date, full performance trials on the Sky have not been carried out, but it now seems likely they will soon be undertaken by the B.G.A. test group at the Cambridge Gliding Club. It has, however, been possible from the flying and tests already done to form a fairly complete picture of the performance. The original estimates by the makers are shown in the curves on p. 357, which indicate that the aircraft had a best gliding angle of 1 in 29. It now seems that the drag figures on which these estimates were based were slightly pessimistic, and it is likely that the best gliding angle is at least 1 in 30.

Tests have been carried out in which a Sky has flown alongside a Weihe so that a direct comparison of performance can be made. These tests have clearly demonstrated that at all speeds the Sky had a lower rate of sink, the difference being particularly marked at the higher speeds. This good gliding angle at high speeds, or penetration as it is called, is one of the principal requirements in a modern high-performance sailplane, particularly if it is to be used for contest flying, where points are awarded for

In this view the high-aspect-ratio wing is seen to advantage; an "X-ray" impression of the rudder's internal structure is also given.



average ground speeds—a direct function of penetration.

The general control and handling of the Sky has received favourable comment from the pilots who have flown it. The controls appear to be well matched and effective, and the ailerons are powerful enough to change the path of the aircraft from a 45 deg banked turn in one direction to a similar turn in the opposite direction in less than 6 sec.

The first prototype of the Sky—which, incidentally, is on view at the South Bank Exhibition—first flew just over a year ago, and since that time considerable development work on the type has been carried out. Several modifications have been incorporated in later aircraft. At an early stage in the prototype trials, for instance, it was decided that it would be advantageous on later aircraft to have the tare c.g. slightly farther forward than was originally intended. This meant that, to maintain the same c.g. range, light pilots had to carry less ballast than was previously the case, while for heavy pilots ballast could be added to the tail, the overall result being a lighter flying weight for the aircraft.

The prototype trials also indicated certain faults in the design of the dive brakes. It was found that brakes of the original size did not limit the terminal velocity to the speed expected, the reason for the error being attributed to a slight over-estimate of the total drag. The trouble was easily overcome by increasing the brake area. It was also found at the same time that the brakes were heavy to close at speeds in excess of 60 m.p.h. Attempts to rectify this, by altering the balance of the areas between the top and bottom brake and by cutting ventilation holes in the brake surfaces, met with only limited success. The trouble was eventually overcome by pivoting the bottom brake surface so that it was free to move through an angle of 30 deg on the operating arms; this allowed it to take up a more favourable attitude in the air stream when the brake was near the closed position, thus considerably reducing the loads on the operating mechanism.

It now seems possible that the British team for the 1952 International Gliding Contest may be equipped with Skys, and the makers are doing all in their power to see that the aircraft supplied for this event are developed to give the best possible performance. A scheme has already been prepared for replacing the landing wheel with a jettisonable undercarriage; this alone should add an extra point to the gliding angle, which, it is hoped, may eventually stand at between 1 in 31 and 1 in 32.

The Sky as an aircraft can already be claimed to be a considerable success, but it still remains to be seen if the sales will be sufficient to repay the relatively large sums of money which have gone into the development of the type. Slingsby Sailplanes estimate that they will be able to produce the type at a lower figure than that for which the Weihes and similar craft are being produced abroad, and this should put the Sky in a favourable position for the export market. The prestige value of a product of this kind, and its influence on the sales of other types produced by the firm, must also be taken into account.

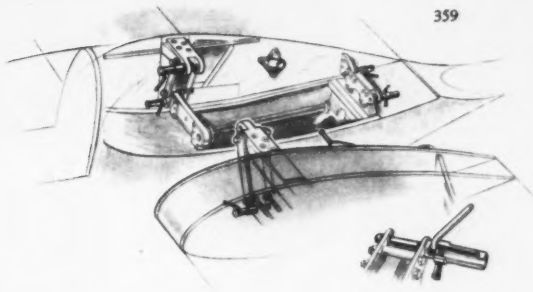
The headquarters of Slingsby Sailplanes are at Kirby Moorside, near Pickering, Yorks.

J.C.R.

SLINGSBY SKY
(High-performance Sailplane)

DIMENSIONS	
Span	59ft
Length	25ft 4in
Tare weight	550 lb
Max. all-up weight	800 lb
Wing area	187 sq ft
Aspect ratio	18.7
Aerodynamic twist	5 deg over tapered portion
Aileron area	15.6 sq ft (each wing)
Tailplane and elevator area	21.6 sq ft
Fin and rudder area	14.5 sq ft
PERFORMANCE*	
Best gliding ratio	1 in 29 at 46 m.p.h.
Min. sink	2.1 ft/sec at 41 m.p.h.
Glide ratio at 60 m.p.h.	1 in 24
Glide ratio at 80 m.p.h.	1 in 16
Flying speed at 6ft/sec sink	73.5 m.p.h.
Max. dive speed	124 m.p.h. (terminal velocity with air brakes open)
Max. aero towing speed	80 m.p.h.

* Based on manufacturers' estimates for first prototype.



Wing-root attachment details. The lower main-spar booms pick-up on a fitting on frame 8, while the upper booms are united by a central pin. The diagonal rear spar picks-up on frame 9. In the foreground is a part-section of an attachment pin of sliding-bolt type with locking plunger.

Mr. F. N. Slingsby, designer of the Sky, secures his harness before being launched on one of the development flights of a prototype.

INTERNATIONAL ASTRONAUTICS

LAST week the second international Congress on Astronautics (the first was held in Paris last year) assembled at Caxton Hall, London. One of the first results of the meeting was the setting-up of an International Astronautical Federation with the objects of promoting the achievement of space flight as a peaceful, instead of a military, project; of issuing technical information directed toward such an end; and of stimulating public interest in the subject.

First president of the new Federation is Dr. Eugen Sänger, one of the more prominent of the German rocket pioneers who now is employed by the French Air Ministry. Discussion also took place as to the eventual establishment of an international astronautical research institute.

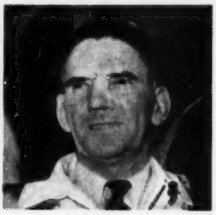
Of the 63 delegates to the Congress—which was organized by the British Interplanetary Society—no fewer than 24 were German; by far the largest national group. Countries represented at the Congress were Argentina, Austria, France, Germany, Great Britain, Italy, Spain, Switzerland, and the U.S.A.

One of the striking things about this aggregation of enthusiasts is that, although to the lay observer untutored in the esoteric mysteries of space travel, the whole subject presents a rather fanciful picture, each and every one of the delegates to the Congress is unshakably convinced that, given only time and money, the astronautical ventures they talk about will certainly come to pass. They say that they already have all the fundamental and technical knowledge they require—they need no new inventions. An impressive assertion.

We cannot help feeling, however, that the amount of money required—it must, at lowest, be measured in millions—puts out of court the possibility of obtaining such a sum from any other source than government; and no government is likely to overload its exchequer without the compulsion of a military aim.

The Pilots at

THE aircraft demonstrated at Farnborough each year are easy to see; not so their pilots, who at this or any other time are apt to be both retiring and elusive. Not without difficulty, therefore, the likenesses of the majority of those who are handling the aircraft during this week have been secured and are reproduced on these two pages, together with brief notes on their careers.



ARMSTRONG SIDDELEY

S/L. J. B. Starky.—A 34-year-old New Zealander with a distinguished war record in R.N.Z.A.F. and R.A.F. Was a Boscombe Down test pilot from 1946-48 before joining Armstrong Siddeley. He has done most of the Sapphire development-flying. (1)

F/L. R. B. Prickett.—Thirty-years-old Canadian who joined the R.A.F. (Fighter Command) in 1940; was later jet-flying instructor and joined A.S. in 1950. Has flown 60 types, including captured German aircraft. (2)

ARMSTRONG WHITWORTH

E. G. Franklin.—An A.W.A. apprentice pre-war, learned to fly at Leamington Aero Club and served in Bomber Command; a Boscombe Down pilot in 1943; joined A.W.A. in 1945; appointed chief test pilot in 1948. (3)

J. O. Lancaster.—Also an A.W.A. apprentice, "Jo" had a war career involving Army, Navy and eventually R.A.F. Fighter Command, then Bomber Command and finally Boscombe Down. Test pilot to Boulton Paul and then Saunders-Roe. Returning to A.W.A. in 1949, became the first pilot to escape by ejector. (3)

W. H. Else.—Joined the R.A.F. in 1940 and trained with the U.S.A.F. in America; distinguished record in Fighter Command before becoming a Boscombe Down pilot in 1944; joined A.W.A. in 1947. (4)

AUSTER

R. L. Porteous.—Probably the most consistent of all demonstrators at flying displays. Pre-war, was flying instructor and junior test pilot to Philips and Powis. In the early months of the war was an S.F.T.S. instructor and was then posted to Rhodesia for similar duties. Joined Austers in 1948. (10)

AVRO

J. H. Orrell.—Chief test pilot Jimmy Orrell is 46 years old and joined the R.A.F. in 1919, serving as an instructor until 1931. Instructional and charter flying from 1931-33. Was with Avros in 1934, with Imperial Airways from 1935-42, and rejoined Avros as test pilot in 1942. Flew communication services to France and Sweden 1939-42. Is flying the Ashton. (8)

R. J. Falk.—"Roly" Falk, now aged 34, was a night fighter pilot during the war, then chief test pilot at Farnborough in 1943; did more than 2,000 hours' test flying at R.A.E. Has flown 300 different types. Is demonstrating the 707. (6)

J. D. Baker.—Joined R.A.F. in 1941; day bombing in Mitchells; Boscombe Down, then flying-boat testing at Felixstowe, leaving to join A. V. Roe. Is now 27. Responsible for much of the Shackleton flying and is demonstrating the type at Farnborough. (7)

J. C. Nelson.—Born in Colorado in 1919, served with Eagle Squadron and in 1942 commanded a special High-Altitude Spitfire Flight. Production test pilot at Vickers in 1943; from 1944-45 in Jet Development Flight at Farnborough; with F. G. Miles 1945-48, then to A. V. Roe. Has lately specialized on the Ashton, the demonstration of which he is sharing. (9)

BLACKBURN AND GENERAL

F/L. Harold Wood.—"Timber," flying the Universal Freighter at Farnborough, has flown over 12,000 hours since he was taught by Cyril Uwins in 1925. Originally a Hillman's Airways pilot; flew a Monospar to Australia in 1936; chief pilot of British American Air Services until 1939; served in R.A.F., then seconded to G.A.L. as a test pilot in 1941. (12)

BRISTOL

A. J. Pegg.—Bristol's chief test pilot. Joined the R.A.F. as an apprentice at 15½, learned to fly in 1925, and became an instructor within three years; later a Martlesham test pilot. Joined Bristols in 1935. Has logged nearly 5,000 hours and flown 150 different types. Piloting the Proteus-Lincoln. (12)

C. T. D. Hosegood, who is flying the Bristol 171 at Farnborough, was appointed the company's chief helicopter pilot early this year. Was a Naval pilot during the war, and later a Naval experimental helicopter pilot; joined Bristols in 1948. (13)

DE HAVILLAND

G/C. John Cunningham.—D.H.'s chief test pilot, 34 years of age, was at the company's Technical School before the war. His war record—which included the destruction of 20 enemy aircraft—is well known. C.O. of No. 604 (County of Middlesex) Squadron until 1948; is Deputy Lieutenant of the County of Middlesex. Established world height record (59,446ft) in Vampire in 1948, and has subsequently made inter-city records in the Comet. Is demonstrating the Comet at Farnborough. (15)

W/C. C. D. Beaumont, aged 47; chief test pilot of the de Havilland Engine Company since 1946. Joined R.A.F. in 1934 and in Bomber Command until 1937; instructor at D.H. School at White Waltham. Fighter pilot during war, then staff duties until seconded to, successively, Vickers, Hawkers and Westlands. Flying Venom Mk I, with reheat, at Farnborough. (16)

S/L. Peter Bois.—Age 32; joining R.A.F.V.R. in 1939, served in Bomber Command, later transferred to Transport Command. An airline pilot from 1946-50, flying on S.A.S Stockholm-New York route. Is sharing Comet demonstrations. (17)

Peter O. Bugge.—Entered Norwegian Air Force in 1939, escaping to Britain after the invasion and joining the R.A.F. in 1941, to fly Beaufighters and Mosquitoes. In 1946 joined S.A.S.; went to D.H. three years later. Is sharing Comet demonstrations. (18)

S/L. John Derry, now aged 29, joined R.A.F. in 1940, was an W.Op./A.G. and received pilot training in 1943, serving in rocket-firing Typhoon Wing. After the war, joined Vickers-Supermarine as a test pilot and went to D.H.'s in 1947. First British pilot to exceed speed of sound (D.H. 108). Is flying the Sea Venom N.F.20 at the Show. (14)

F/L. D. de Villiers, age 28, is chief test pilot of de Havilland Propellers, Ltd., and is demonstrating Mamba-Marathon. Served in Fighter and Coastal Commands (Beaufighters) during war; seconded to D.H.'s in 1943. (19)

S/L. R. W. Jamieson, 33-year-old New Zealander, and member of D.H. sales department. Learned to fly in N.Z. and joined the R.A.F.V.R. in 1937. Was an instructor during the war and was later an Airborne Forces pilot; joined D.H.'s on demobilization, was a production test pilot from 1945-49. Flying the Heron.

Geoffrey H. Pike was apprenticed to de Havillands in 1934 and became an experimental test pilot in 1939. Joined R.A.F. Reserve in

Farnborough

Most of them have distinguished war records—and so many decorations that even the usual abbreviations cannot be included here. The numeral given in parenthesis at the end of each paragraph refers to the appropriate portrait. We hope to include reference to pilots of any "last-moment surprise" aircraft which may appear at Farnborough elsewhere in this issue.

1936 and the Volunteer Reserve in 1938. Is piloting the Dove Mk 2. (21)

J. W. Wilson.—Now aged 27, joined R.A.F. in 1943 and was an instructor with F.T. Command, later being posted to T.A.F. in Burma. After service in various fighter squadrons was posted to the Central Fighter Establishment Is handling Vampire Trainer at the Show. (20)

ENGLISH ELECTRIC

T. B. O. Evans.—Demonstrating the Canberra in the absence of W/C. Beamont in America. Served as fighter pilot during war, in Far East and elsewhere. From 1944 until he joined English Electric in 1950, was development-flying jet aircraft for the R.A.F. (23)

FAIREY

J. O. Matthews.—An ex-fighter pilot (destroyed 11 enemy aircraft) and instructor who joined Faireys in 1946, after leaving Central Fighter Establishment. Is demonstrating Firefly Mk 7. (25)

G/C. R. G. Slade.—Aged 38, Fairey's chief test pilot. Commissioned in 1933 and became Martlesham pilot in 1937. During war commanded night fighter squadrons, C.F.S. Handling Squadron and several other special units. Is demonstrating Gannet. (24)

L. P. Twiss.—An ex-naval pilot with distinguished war record who joined Faireys in 1946. In latter part of war was member of several development-flying commissions sent to U.S.A. Successful air-race competitor. Is sharing Gannet demonstration. (27)

D. J. Masters.—Also with Faireys since 1946. During war was instructing in Rhodesia, then with Bomber Command. Is sharing Firefly Mk 7 demonstrations. (26)

GLOSTER

Jan Zurakowski.—Originally member of Polish Air Force, was fighter pilot during war, then Boscombe Down test pilot. Has flown 2,500 hours on 54 types, mostly fighters. Joined Glosters in 1947; holds several records. (28)

HANDLEY PAGE

S/L. H. G. Hazelden.—Chief test pilot since 1947. Three years with Bomber Command during war, then with Heavy Aircraft Testing Squadron at Boscombe Down, 1944-47. (29)

HANDLEY PAGE (READING)

Hugh Kendall.—Canadian by birth, has been with the company since its formation three years ago; formerly a naval pilot. Is an expert gliding pilot. (30)

NAPIER

Michael Randrup.—Ex-fighter pilot seconded to A.S.T. and R.A.E. in later war years; C.O. of R.A.E. engine-test flights, 1946; joined Napiers in 1946 and is demonstrating Nomad-Lincoln "test-bed". (22)

H. K. Cartwright.—From S. Rhodesia. Was with Wilson Airways, Kenya; flew Blenheims and Hurricanes in Greece and India; R.A.F. test pilot, then joined Napiers in 1945. Sharing Nomad-Lincoln demonstrations.

HAWKER

S/L. Neville Duke.—Chief test pilot with outstanding war record on fighters. After war, was R.A.F. test pilot and member of high-speed flight. Holds London-Karachi speed record. Is demonstrating P. 1067 and naval P. 1052. (31)

PERCIVAL AIRCRAFT

R. G. Wheldon.—In R.A.F. 1936-47. During war was a test pilot in Maintenance Command. Joined Percivals in 1947; chief test pilot, 1950. (32)

J. F. Arnold.—Civil flying instructor before war. Served as instructor and with Transport Command (North Atlantic service) during war. Manager and C.F.I., Luton Flying Club, then Hunting Flying Club, 1945-48. Has done over 5,000 hours on 50 types.

SCOTTISH AVIATION

N. J. Capper.—In R.A.F. 1929-34; later with Hillman's and Imperial Airways; C.F.I. at various E.F.T.S.s during war. Returned to Scottish Aviation after war; has considerable helicopter experience. (34)

SHORT BROS. AND HARLAND

T. W. Brooke-Smith.—Handling Short's new bomber. Born 1918; learned to fly at Brooklands, was an airline pilot, then, during war, was delivering Stirlings with A.T.A. Joined Short Bros. in 1942. Has flown 120 types, from sailplanes to big flying-boats. (35)

VICKERS-ARMSTRONGS

E. B. Trubshaw.—An ex-pilot of the King's Flight who joined the firm last year. Born 1924 and is a keen cricketer. (37)

G. R. Bryce.—Served in Fighter, Coastal and Transport Commands, then in the King's Flight; joined the firm in 1946. Has over 5,000 hours on 45 types. Appointed chief test pilot at Weybridge last July. (39)

VICKERS-SUPERMARINE

D. W. Morgan.—Now aged 28, was D.H. Technical School student and then in R.A.F.; transferred to Fleet Air Arm, 1944. Graduating from E.T.P.S. in 1948, was with Carrier Trials Unit; joined Supermarine last year. Qualified helicopter pilot. (40)

M. J. Lithgow.—Flying the newly revealed Supermarine 508; the company's 31-year-old senior experimental pilot, was an R.N. pilot until released in 1945 to join Vickers-Armstrongs; won S.B.A.C. Cup Race last year. (38)

WESTLAND

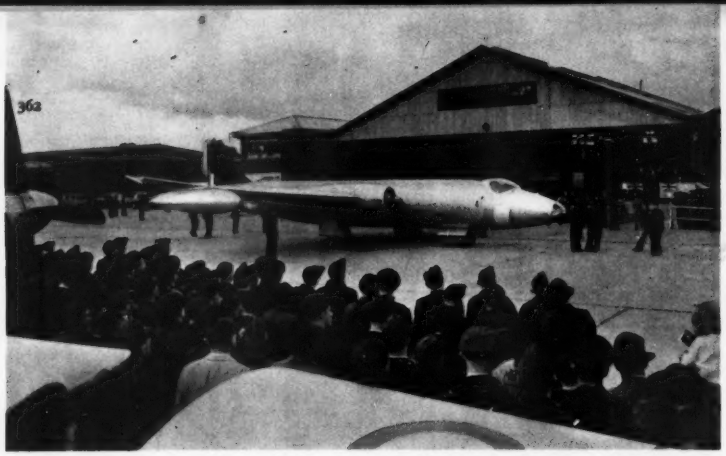
R. S. Bradley.—Ex-Naval pilot; was with Patrick-Durval Aviation and then Helliwells, Ltd., before joining Westlands last year. Is flying the Wyvern. (33)

S/L. D. Colvin.—Ex-fighter pilot who went on to Scottish Airlines and helicopter instruction after war. Is demonstrating the S-51. (36)

MINISTRY OF SUPPLY

S/L. R. H. Smyth learned to fly with U.S.A.F. just before Pearl Harbour. Joined a Polish night-fighter squadron and flew night intruder ops. in Mediterranean area. Since graduating from E.T.P.S. after war has commanded Aerodynamics Flight at R.A.E. and made first flight of Boulton Paul Delta, which he is demonstrating at the Show. (41)

Lt. J. Elliot.—After a not uneventful war career as an R.N. pilot (including Arctic convoy escorts) was in the Service Trials Unit from 1943 to 1948. Awarded McKenna Trophy at E.T.P.S.; posted to R.A.E. Aerodynamics Flight in 1949. First naval officer to land a swept-wing aircraft (Swift) on the deck of a carrier. (42)



The official welcoming ceremony on the tarmac at Laverton, where the Canberra evoked the most enthusiastic comment among R.A.A.F. personnel and civilian spectators. In the words of an official R.A.A.F. release it had left "a trail of shattered records" behind it.

CANBERRA IN AUSTRALIA

The crew—F/L. C. Harvey (navigator/wireless operator) and W/C. D. R. Cuming (pilot)—were warmly greeted by Air Marshal George Jones, Chief of the Australian Air Staff.

THE first jet flight between England and Australia was, as the world already knows, by an English Electric Canberra, which arrived at Darwin from Lyneham on August 5th in the record flying time of 21 hr for the 10,200 miles—an average speed of 486 m.p.h. At the capital city, the name of which it bears, the silver-and-black bomber was welcomed by the Prime Minister, Mr. R. G. Menzies, and before landing at Laverton (the R.A.A.F. base just outside Melbourne) it flew over that city as the Lord Mayor of London, Sir Denys Lowson, drove in full regalia from Government House to the Town Hall. Before reaching Laverton, incidentally, the Canberra was joined by an escort of two Vampires which found themselves hard-pressed to keep station.

The Canberra's pilot, W/C. Derek Cuming, declared himself well satisfied with the trip and assured questioners that the Canberra was easier to fly than an Anson. More than 10,000 gallons of kerosene were burned on the flight; even so, consumption of the Rolls-Royce Avons was lower than expected. It is understood, in fact, that at every point the Canberra landed with a comfortable fuel reserve.

In large measure the success of the flight was due to the accuracy of the met. forecasting, this in spite of the fact that little is known about upper-air conditions in the Indian Ocean area. In that part of the world some exceedingly low temperatures were recorded, but under these conditions, as in fierce heat, the Canberra acquitted herself faultlessly.

When a second Canberra is flown out to Australia later this year the pair will be used to train R.A.A.F. crews before locally-built Canberras come off the production line. Air Marshal George Jones, Chief of the Australian Air Staff, has disclosed that the R.A.A.F. Canberras will probably be used in the intruder role.

A crowd of about 400 awaited the Canberra at Fairbairn, the agreeable surroundings of which are visible here. No photographing of details of the aircraft was allowed. For this photograph, and others on this page, we are indebted to the R.A.A.F.

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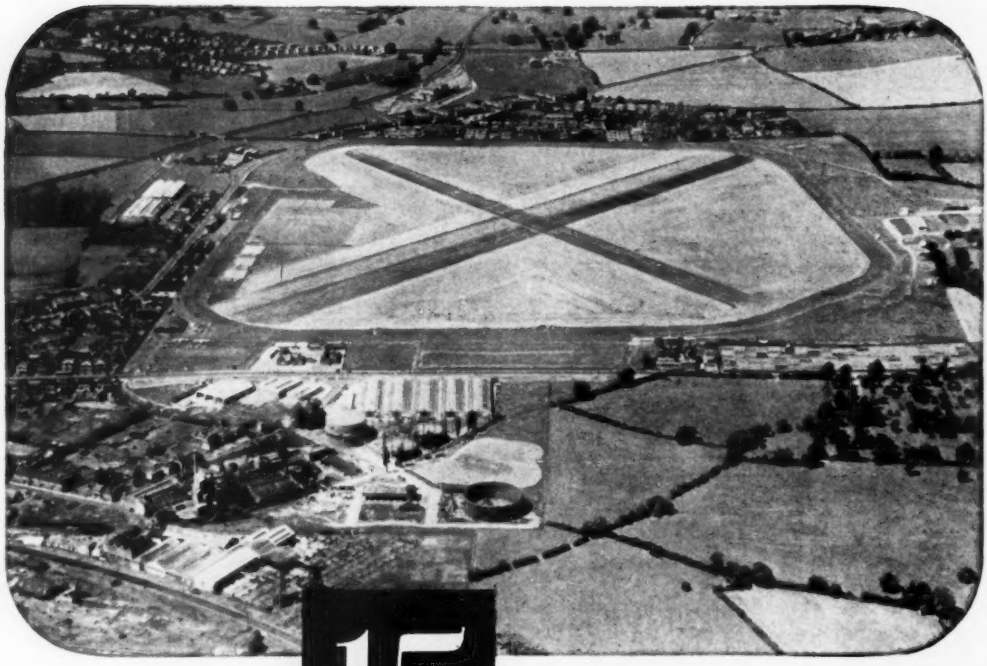

15

Recognize this airfield? It's No. 15 in this series of puzzle photographs. You'll find the answer below on the right. ★

Everyone in aviation knows the familiar Shell and BP Aircraft Servicing Vehicles — but not so many know about the efficient organisation behind the scenes which maintains this round-the-clock, all-the-year Shell and BP Aviation Service; always to be relied upon, always available at twenty-five aerodromes throughout the country.

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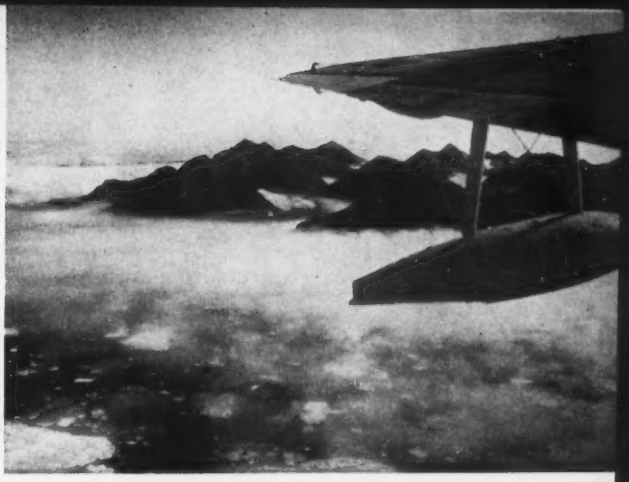
FAR-NORTH RENDEZVOUS

The Story of a Sunderland and a "Perfect Interception" in Greenland

LAST week we briefly reported the news that an R.A.F. Sunderland had flown to Greenland to pick up a scientific-survey party, had made contact with them, and had duly brought them back to this country. Behind these bare facts lies an eventful story, told here in characteristically entertaining style by W/C. Charles Gardner of the B.B.C., who flew in the aircraft.



Typical Greenland coastal scenery—including mountains, pack-ice and fog—photographed from the Sunderland, during the flight described here.

By CHARLES GARDNER

THE background history of this Coastal Command sortie into the Frozen North was that, five weeks previously, three Naval officers and one Royal Marine officer had been put down by Sunderland flying boat at Seal Lake in North-Eastern Greenland (Lat. 77° 04′ N. Long. 21° 56′ W.) as the starting-point of an exploration of Queen Louise Land. Special attention was being paid by this exploration party to an area some thirty to fifty miles west of Seal Lake, and in particular to a big lake there which had promising prospects as the flying-boat base for a subsequent and larger-scale expedition which is planned for next summer.

So far as I could gather, the object of this first "pilot" expedition (and of the larger one which is to follow) was, and is, purely to revive the Naval tradition of survey and exploration, and some hectic newspaper surmises that military bases were being sought for N.A.T.O. were discounted by those concerned. The R.A.F.'s part in the adventure was, however, confined to taking the Naval party up to Seal Lake in July, and picking it up again in August—with no questions asked.

The July flight was successfully accomplished by a Pembroke Dock Sunderland commanded by W/C. George Barrett, A.F.C. (the station's Wing Commander Flying), with S/L. J. Higgins, D.F.C., A.F.C., as second pilot. On the way back, this Sunderland picked up, and flew to Britain, an ailing Anglo-Greenland infant and its anxious mother, an act of mercy which hit the headlines to the almost total exclusion of the main purpose of the flight. (Incidentally, the baby—loaded at Reykjavik and landed at Dundee—was successfully operated upon and is now on the way to recovery.)

The Naval exploration party consisted of Cdr. (L) C. J. W. Simpson, D.S.C., R.N. (senior officer), Capt. M. E. B. Banks, R.M., Lt. F. R. Brooke, R.N., and Lt. Angus Erskine, R.N. It was re-inforced by a Dannish trapper who was familiar with the Seal Lake area, and who contributed to the party his team of huskies. This specialist, whose name I can neither spell nor pronounce, was known to the Sunderland crew simply as "Ulla the Trapper", and his normal base hut was at the eastern end of the crescent-shaped Seal Lake—some thirty miles from the western end, where Cdr. Simpson had established his base for the inland push over twenty miles of glacier to Queen Louise Land. Five weeks were allowed for the actual exploration, and the rendezvous date for the Sunderland pick-up was Monday, August 27th—nearly the latest certain date on which Seal Lake would be clear of ice.

On Wednesday, August 22nd, the Sunderland party assembled at Pembroke Dock. George Barrett and Jim Higgins and their crew were once again on the job—that crew being F/L. Swain, D.F.C., and F/L. Collyer (navigators), F/L. McPherson and F/L. Morrison, A.F.C. (engineers), F/L. Josey, D.F.M., and Sgt. King (radio operators), and F/Sgt. C. N. Johns (photographer). Also on the trip were David Prosser (Television News Reel), Cedric Baines of the News Reel Association, and myself. Take-off was planned for Thursday, August 23rd, along a route to Reykjavik (night stop); Ella Island in Greenland (night stop); and a final run up to Seal Lake on the 26th (night stop on board), giving us a day in hand on the rendezvous date of August 27th.

Ella Island (Lat. 72° 52′ N., Long. 25° 09′ W.) is a Danish base near the Eastern Greenland coast, and on King Oscar's fiord. It is used annually by a Danish arctic survey party equipped with Catalina (or, more properly, Canso) amphibians, and commanded by Col. Helk of the Danish Army (who, in the late hostilities, was "Private" Helk of the Buffs, but was afterwards warded the O.B.E. in the rank of captain).

We knew that Col. Helk's contingent (about which many stories could be told) was due to pull out of Ella Island for the winter by the end of August. This was not because of ice on the fiord, but because the low sun after August makes photo-survey impossible. We naturally wished to be through Ella, in both directions, before Helk's boys packed up, and home comforts (such as a dinghy service, radio, hutted accommodation, and a cookhouse) packed up with them. In the event, however, our day in hand on schedule vanished before we started, because the U.K.-Iceland weather on August 23rd was so bad that take-off was postponed for 24 hours until the morning of Friday, August 24th. Starting then, the flight to Reykjavik was made without incident in 7½ hours, and we landed in the South harbour, where Sunderland RN 299 (P/230) was refuelled at the buoy by underwater pipeline from a bowser on the pier.

Then came frustration. For three days we cooled our heels at Reykjavik, waiting for weather to clear for the five- or six-hour flight across the Denmark Straits to Ella Island. An occlusion had settled on the straits, with cloud-base at 100ft and tops at 10,000 or 11,000, and was solid to the rugged coast of Greenland as far north as Scoresby Sound. Irritatingly, we were clear at Reykjavik and it was clear at Ella Island, but with four hours of blind flying in cloud terminating in sheer mountains (still in cloud) and with suspect met-winds and a very dicky radar, the trip overseas, for a Sunderland of 8,000ft ceiling, was just "not on." We did try, but were forced down to 30ft above a 60-kt Atlantic gale, and were unable to climb clear of the "clag"; so we had to return.

By the night of Monday, the 27th, we were frustrated and miserable. We were already a day late on rendezvous and were very worried indeed about ice on Seal Lake, which had then been reported as at minus one Centigrade for five days. This report was from a lonely Danish met. station at Denmarkshaven (76° 46′ N., 18° 46′ W.), which is in the Seal Lake area. Furthermore, there was a possibility that Simpson and company were sitting, not at Seal Lake, but on the shores of their newly explored hinterland water (assuming it suitable for a flying-boat) and were waiting for their pick-up there, which would save them a two-day walk back to base across very difficult country. We also knew, however (which Simpson didn't) that we had orders NOT Repeat NOT to risk this new lake, but to stick to Seal; and so a possible two days of extra ice-forming delay could easily accrue while a cursing Simpson slogged it back over the glacier to the original rendezvous. We were beginning to feel very sorry for Simpson and his enforced winter in the Arctic, which we now reckoned as an even-money bet.

Col. Helk at this stage came back by Canso from Ella (he found it fairly easy to fly through the weather, as he was heading towards a well-equipped Iceland and its aids such as a G.C.A. at Keflavik). He told us that, in his view, Seal Lake should not ice-up yet awhile; that no radio contact at all had been made with Simpson since he was landed; and that the air evacuation of his own party from Ella was now half complete.

Next afternoon (the 28th) we had another crack at the Straits, and this time we got through. We burst into view of the Greenland coast at about 100 miles and right into the teeth of a 60-70 kt headwind. With 140 kt on the clock and an observed ground speed of 70 kt, we closed Scoresby Sound inch by inch *via* pack-ice and icebergs which never seemed to get any nearer. The clear-air visibility in these areas is fantastic, and at 2,000ft some of the

(Left) The expedition party comes aboard the Sunderland, with W/C. Barrett, for their first hot meal for a month. (Right) A Greenland fiord.

FAR-NORTH RENDEZVOUS . . .

sharply visible Greenland peaks were at least 120 miles away.

It was now well into the evening, and Shorty Collyer and Vic Swain had deduced that twilight at Ella was 0030 hr G.M.T.; Col. Helk had advised a landing at least an hour before that. It seemed unlikely that we should make it in time with such a head-wind, and W/C. Barrett began to plan where and how he should orbit away the four hours of arctic night. A night landing was out of the question, as Ella is surrounded by mountains which make a daylight approach a matter of steep turns inside steeper canyons. In the end, by taking short cuts, and aided by a wind drop, we reached Ella well ahead of danger time.

There, half of us slept ashore in the Danish huts, and the other half had a cold time on the aircraft, but the local cookhouse was still going, and Col. Helk had left us some beer; so on the morning of the 29th (Wednesday) we were able to appreciate the clear blue skies and sparkling sunshine which are a constant feature of Greenland's summer. The semi-permanent "high" over Greenland's great ice-cap ensures perfect flying weather for most of the year—the only snag being the occasional 100-ft layer of sea fog on the coast's edge and stretching for perhaps five miles or so inland. With perpetual daylight for the whole summer and incredible visibility, Greenland seems to be to be well suited for aviation, provided supplies are organized on an airborne basis. Thick pack-ice off the east coast often prevents supply ships reaching the coast from one year's end to another, as indeed it did this year, when Denmarkshaven had to be "relieved" by an Icelandic Airways' Canso from Reykjavik. There also seemed, to the casual glance, plenty of possible sites for land airfields on the many islands of the eastern fringe. The coastal mountain ranges, however, are high and rugged, and their bare brown sides are cut by huge glaciers tumbling down to the sea from the ice-cap plateau of the hinterland. These glaciers, hundreds of feet thick of solid ice, spill over the sheer sides of Greenland like fluting down the sides of an iced cake.

At Ella we heard the disquieting news by radio from Denmarkshaven that Simpson's husky team had been found wandering loose at the eastern end of Seal Lake and in bad condition. There was no human with them, and it was anybody's guess what all this meant. Denmarkshaven had sent some people to look at Seal Lake, because they had had no radio contact with Simpson. The discovery of the dogs heightened the anxiety.

When we took off on the last leg to Seal, therefore, W/C. Barrett took all the short cuts across the islands and up the fiords to reach the rendezvous at top speed—which we did in 2½ hours. A quick look at Ulla's hut at the eastern end of the lake showed no sign of life there, and we sped west over the water between mountain walls, which made us feel as if we were flying in the Grand Canyon. There was, thank heaven, no ice on the lake, and only one or two very young icebergs. Seal Lake terminates at the western end in a glacier, and it was at the foot of this glacier that the original rendezvous had been fixed for three days earlier. With all eyes on this spot, we soon made out a tent on the foreshore—but of human beings there was no sign at all. George Barrett practically "aerobatted" the Sunderland round between the mountains to get a close look at the tent, and it was soon obvious that the party's two sledges were there, and so was their "J" type dinghy—but that was all.

We landed, and after dragging anchor once and nearly drifting on to an iceberg, we finally "held", and then had to study the enigmatic tent (300 yards away) for half an hour while our "J" type was pumped up by hand (the bottle just made a faint puff and faded out). At this stage we were very worried indeed, and dramatic theories were freely exchanged, polar bears and crevasses figuring largely.

Eventually Barrett took a party of us ashore in the now-inflated dinghy, in which we drifted to land on the end of a pay-out rope from the .5 hatch. Examination of the tent showed that it had not been occupied for weeks, and that much equipment was still there, while some was missing. There was no message, but there were some fresh-looking human footprints in the sand. The mystery of no radio contact was explained—the radio set and cycle-type generator were still in the tent.

We were now up a gum tree—and the only thing left to do was to take-off again to search the glacier and visit Simpson's new lake over in Queen Louise Land. While we were discussing this, Baines let out a yell and pointed to the glacier, where a small, remote figure was to be seen waving and running towards us. It was Simpson—and we all ran from the tent to meet him in a "Dr. Livingstone I presume" scene at the glacier's foot. Unshaven, arctic-clad, and bowed under the weight of a huge backpack, he explained all in quick glad sentences. After collecting Ulla and his dogs from Eastern Seal Lake, the party had footslogged it for 20 miles west over the glacier. Sledges would have broken up over ice which was like a frozen Atlantic gale and gashed by huge crevasses, so the dogs were given a shot musk-ox to eat and turned loose (hence the dog mystery). There was no space for a radio in back-hauled luggage (hence no radio), and the whole trip had been by foot. The 6,000-ft mountain edge of the hinterland had been climbed, the glacier crossed, and the unnamed lake surveyed and found suitable for flying-boats. A sortie had been made 30 miles west of the glacier and bags of geological and other specimens collected, many notebooks filled, and a sledge-route for next summer had been found and logged.

All this had meant five weeks of living on pemmican, oatmeal, honey and biscuits (2 lb per day per man). On rendezvous date (August 27th) Simpson and party had sat down on their new lake and waited in the hope that the Sunderland would land there, just as we had guessed. When the boat didn't come, and as rations were short, they upped-sticks and slogged it back for two days over the glacier to Seal Lake and the original rendezvous, and were still two hours away when they saw us circle for landing. Simpson thereupon broke into a jog-trot, fearful lest we take off again and leave him fallen between two stools. (He needn't have worried—we would have based ourselves at Seal Lake for a day or so.) However, all was well, and we reckoned that, in the event, we had made the perfect interception, both parties arriving at Seal Lake within an hour of each other.

Soon all the Simpson party was down from the glacier, and they were promptly piled into a dinghy and ferried aboard for ham and eggs, which they greeted with cries of delight akin to those recorded in the more imaginative food advertisements. Meanwhile we dismantled their camp. The fresh footprints still puzzled us, but Ulla said they were the party's own of five weeks ago; they were still fresh, for no wind or rain had disturbed them.

The return trip was straightforward—night stop at Ella, then back to Pembroke Dock *via* Reykjavik, where our bearded and grimy explorers bathed and "shaved-off" once more to become respectable officers of His Majesty's Services. On our way back to Ella we parachuted supplies and mail to the met. stations at Denmarkshaven and Daneborg—which, with Ella, are the only little clusters of human habitation north of Scoresby. Everyone in both places waved frantically—but to me the most touching thing was to see, at the back of these lonely ice-bound settlements, the white crosses on the graves of the men who had died on their service in the frozen wastes.

GM1

"Time to height" Records

We were there too—of course

The Gloster Sapphire Meteor, which (subject to confirmation) set up four new rate of climb records on August 31, puts another feather in the cap of Britain's aircraft industry. This machine, of course, included in its construction DURALUMIN aluminium alloy.

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I.A.T.A. MEETS in LONDON

The Prime Minister Welcomes Delegates to I.A.T.A.'s Seventh Annual General Meeting

A general view of the 600-year-old hall of Westminster School (transformed by modern furnishings), in which the annual general meeting is taking place.

FROM the dignified silence in which some 160 of the world's leading civil aviation personalities awaited the arrival of the Prime Minister, the Rt. Hon. C. R. Attlee, M.P., to open I.A.T.A.'s seventh annual general meeting last Monday, one sensed immediately the full importance of the occasion. But though dignity was plainly manifest there was nothing solemn or cheerless about the meeting. Rather was it characterized by what—for a 40-nation gathering—must have been an unprecedented degree of friendliness. In these quarrelsome days it is indeed refreshing to encounter such a spirit of international amity as that born of mutual interest in air-transport affairs.

Sitting-in on the plenary session, we felt that here man's progress towards a better world was truly being measured—an impression which was heightened by the fact that the meeting was taking place in one of Britain's oldest buildings, the 600-year-old hall of London's historic Westminster School.

A fanfare by trumpeters of the Royal Air Force heralded the arrival of the Prime Minister and, with I.A.T.A.'s new president, Sir Miles Thomas, in the chair, the five-day conference got swiftly under way.

In an address of welcome to the delegates, among whose ranks were names which are now almost legendary in the air-transport world, the Prime Minister said that although the industry was a youthful one it nevertheless seemed fitting that it should meet in these ancient precincts. Air transport, he thought, was more than an industry; it was a great service designed to bring about a closer relationship between the peoples of the world. Meeting amid such memorials of the past, delegates would be reminded that the passing of the years had meant for mankind a constant adaptation to new conditions. At Westminster, that adaptation had been going on for centuries—and we sought always to carry with us into the new epochs the best traditions of the old.

After briefly reviewing I.A.T.A.'s history, the Prime Minister paid tribute to what he termed the "day-to-day contribution" of the airlines through the medium of I.A.T.A. to the working of the inter-governmental body. He mentioned particularly the assistance which I.A.T.A. had given to I.C.A.O. in the development of a system of bilateral agreements between governments for the orderly exchange of rights. He complimented the Association, also, on the part which it had played in recommending a unified, world-wide pattern of rates and fares, and expressed the view that it would be a blessing for statesmen if the high degree of goodwill and readiness to co-operate which was apparent in I.A.T.A. could be emulated in other spheres of international relations.

Mr. Attlee recalled the words of his former colleague, the late Mr. Ernest Bevin, who, he said, had wished that we might one day have a world in which passports were not needed, where one could merely buy a ticket and go off anywhere. This wish, he was sure, would be echoed by all I.A.T.A. members, for world peace was a condition of their activities, and the services provided by airlines should be a great means of increasing international understanding.

Before formally thanking the Prime Minister for consenting to open the meeting, Sir Miles Thomas read a message of greeting which the Association had decided to send to H.R.H. Princess Elizabeth, in her capacity as the Grand Master of the Guild of Air Pilots and Air Navigators of the British Empire. On behalf of B.O.A.C. and B.E.A., who are acting as joint hosts, he also extended a warm welcome to all delegates and their wives. It was particularly appropriate, he felt, that the annual general meeting should be held in London in this Festival year since the original pre-war I.A.T.A. was to a great extent British-inspired.

The year 1951, he thought, seemed to be ushering in not only a new half-century but also a new era in air transport. The whole process of international commerce and relations had become geared to the speed of air travel, and it must now become the task of the operators to widen this market to the greatest possible extent.

Sir Miles Thomas then indicated two main developments which he considered to be imminent. The first was a great increase in speed and the second a great increase in scope. Lack of time, he said, was still just as much a limitation to travel as expense. He was certain that higher speeds would make air travel available to a very much larger public. Also, it would soon be available for many more people in the middle-income groups, for although there were considerable problems to be solved before the airlines embarked on further fare reductions, he was certain that the difficulties would be overcome and that millions of new customers would soon enjoy the benefits of air transport.

Addresses were also given by the retiring president, Mr. Warren Lee Pierson, of T.W.A., and by Sir William Hildred, I.A.T.A.'s permanent director-general. We intend to publish summaries of these speeches, and a report of the discussions themselves, in a forthcoming issue.

The Prime Minister gives his inaugural address. Left to right: Sir Miles Thomas, president; Sir William Hildred, director-general, and Lord Douglas of Kirtleside, chairman of B.E.A.

TALKING of HELICOPTERS

Outspoken Views at Helicopter Association Dinner—and more about the Piasecki Lecture

As already reported, Mr. Frank N. Piasecki read a paper on *Military Aspects of the Transport Helicopter* before the Helicopter Association in London on August 31st. We gave a summary of the lecture last week (page 337), and below is a report on the Association's annual dinner, held at Londonderry House following Mr. Piasecki's address at the Institution of Civil Engineers. Also given below, after the report of the dinner speeches, are notes on the discussion which followed the lecture.

Proposing "The Guests," the president, Mr. J. G. Weir, said that this fifth annual dinner might rank more as a centenary if one judged by the progress which had been made with helicopters since the Association became a corporate body. He welcomed Lord Douglas, the guest of honour, who had done a great deal to help the Association, and Mr. Piasecki and other distinguished members of the American Helicopter Society who were present. Mr. Weir (who has been president for the past two-and-a-half years and is to hand over to Mr. Eric Mensforth) said that he foresaw a period of great expansion and activity during his successor's period of office.

Replying, Lord Douglas (who is chairman of B.E.A.), delighted his audience by departing from any prepared oration and frankly speaking his mind. Development of helicopters was not quick enough, he said. Three-seat accommodation was hopeless as a commercial proposition. He had heard glowing accounts of future methods of linking our closely situated large cities. We needed helicopters very badly: we needed counterparts of Green Line buses, but were told that we could only have them in due course. There was tremendous scope, but there must be quicker development. From the user's point of view, Lord Douglas said, a big, economic helicopter was wanted.

Mr. S. Scott-Hall (Ministry of Supply), toasting "The Association," said that Mr. Piasecki's lecture had once more thrown down America's tremendous challenge in helicopter development. For many years this country had lacked a society where people could get together and discuss helicopters, but from September, 1945, the Association had been formed and had done its job well. Praising the work of Mr. Weir (who had originally brought Señor Cierva to this country) and other officials of the Association, Mr. Scott-Hall said it was also fitting to remember the work of Alan Marsh, who had given his life for all that the occasion stood for. The speaker went on to say that we must have more helicopters, and, as a small country, should pool ideas and do away with selfish competition. The Government would help, and was at present doing its best to foster collaboration.

In his reply to Mr. Scott-Hall's speech, Mr. Peter Masefield (chief executive, B.E.A.) thought it "appropriate for two B.E.A. representatives to do a pincer movement on the Director of Technical Development (Air) of the Ministry of Supply." He paid a tribute to the members of the B.E.A. Experimental Helicopter Unit, and hoped that very soon the "Experimental" would be taken out. He wished the Unit was three times as big, and that its aircraft were ten times the size and had twice the speed. To run services with three-passenger helicopters was like trying to run an airline with Austers. The Bristol 173 would give Mr. N. E. Rowe and B.E.A. something to work with (in fact, he said, the Bristol 173 will really give Nero something to fiddle with). B.E.A. hoped to pull the 173 out to its elastic limit, and perhaps persuade Bristols to put wings on it. He mentioned that the Piasecki H-16 was now being built to carry 40 passengers. Perhaps now was the time to raise B.E.A.'s sights and ask for even more than 40. He hoped that the ultimate replacement for the Elizabethan, which was to be put into service this week, would be a helicopter. Records showed that all aircraft to be replaced so far had been followed by something larger, so that should give an aim for helicopter development. He visualized roof-to-roof service from the Champs Élysées to Victoria Station. The money for helicopter services must come from big city centres. Employing a telling phrase that he has used before, Mr. Masefield added that for the next few years "it will help if we can ride home on the back of the military camel." Finally, he said that Mr. Piasecki had done a great service in outlining what could be done with rotating-wing aircraft; the fighting Services in this country had, he thought, been slow in this respect. He hoped that there would not be "too much security," for the helicopter needed putting over. He appealed to Mr. Scott-Hall and his aptly named Ministry to "think big."

THE LECTURE DISCUSSED

After the reading of Mr. Piasecki's paper most of the discussion had centred on his choice of the twin-rotor configuration. Replying to these expressions of opinion, the lecturer said he was convinced that for machines of over 6,000 lb a.u.w. this was the most desirable layout; one of its advantages (of particular importance for military application) was the greater c.g. range it made possible. In comparative tests for the U.S. Navy, between single- and double-rotor systems, the latter had proved conclusively superior. For carrying heavy items, such as jeeps and howitzers on a sling, the pendulum effect was less critical and had to a certain extent been overcome by using the two-point suspension rig. The Piasecki 40-seater, the XH-16, was "well on the way," but it was not possible to give any details.

Mr. Piasecki went on to suggest that the number of rotor blades employed should be kept to an absolute minimum; turbine-power associated with tip-jets would reduce the number, and this, he thought, was "the coming form" of propulsion.

Questioned as to the practicability of the inflatable-bag type of undercarriage for emergency use on water, the lecturer said that about 500ft of height was needed in which to inflate the rubber pontoons sufficiently with CO_2 bottles. On the general subject of emergency landings, and in particular on those resulting from enemy action, he pointed out that in Korea, so far, no helicopter had yet been downed by gunfire damage to its rotors. On test, one twin-rotor machine had actually made a landing from 200ft after a rotor blade had come adrift completely. There had been many instances, he said, in which blades had been holed but this had made relatively little difference to performance.

On the general outlook for helicopters, Mr. Piasecki thought that machines of 250,000lb a.u.w. were not impossible. For such aircraft he envisaged a shaft-drive system to four or more rotors.

THE BATTLE OF BRITAIN FLY-PAST

THE 280 aircraft which, as reported in *Flight* of August 24th, are taking part in this year's Battle of Britain fly-past next Saturday, September 15th, will rendezvous over Southend before making the final approach to Whitehall. As in the past, they will be led by a single Battle of Britain Hurricane, which is due to pass over the Air Ministry at 11 a.m. The approach to Central London from Southend will be *via* Stanford-le-Hope, Rainham Marshes, Royal Albert Dock and West India Dock, and the 11 formations will be constituted as follow :—

(1) 1 Hurricane, 3 Sunderlands
(2) 30 Lincolns
(3) 3 Lancasters, 6 Lincolns
(4) 30 Washingtons
(5) 8 Sea Hornets
(6) 48 Vampires
(7) 48 Meteors
(8) 48 Meteors
(9) 24 Meteors
(10) 16 U.S.A.F. F-84s
(11) 16 U.S.A.F. F-86s

On their way to the rendezvous at Southend the 11 formations will pass separately over the provincial towns shown in the following list; in each case the number in parenthesis indicates the formation as given above.

(1) Calshot, Dover, Ramsgate (Sunderlands only)
(2) Orfordness
(3) Portsmouth, Deal
(4) Lowestoft, Orfordness
(5) Worthing, Folkestone, Ramsgate
(6) Brighton, Rye, Canterbury
(7) Orfordness
(8) Hastings, Canterbury
(9) Ipswich, Clacton
(10) Manston
(11) Felixstowe

After the fly-past, the formations will disperse over West London and selected aircraft will then pass over the following towns: High Wycombe, Bicester, Leamington (30 Lincolns), Reading and Swindon (3 Lancasters, 6 Lincolns), Aylesbury and Northampton (30 Washingtons); Dorking and Littlehampton (8 Sea Hornets); Wokingham and Weybridge (Vampire formations), Watford (Meteor formations).

The Meteors and Vampires will represent Fighter Command; Lincolns and Washingtons, Bomber Command; the Sunderlands, Coastal Command; three Lancasters and six Lincolns, Flying Training Command; and the eight Sea Hornets, Naval Aviation.

As usual, the aircraft will fly at between 1,500 and 2,000 ft, with the formations finally closing to one-minute intervals.

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TIME-TO-HEIGHT RECORDS

Further Details of the Sapphire-Meteor's Remarkable Achievement: Observation Methods

THE versatility of the Gloster Meteor and the power of the Armstrong Siddeley Sapphire 2 were dramatically demonstrated at Moreton Valence on Friday, August 31st, when F/L. R. B. Prickett established no fewer than four official time-to-height records. The records—announced, subject to confirmation, as our previous issue closed for press—were briefly recorded last week. They are as follows:—

3,000 metres (9,843ft)	... ...	1 min, 16 sec (7,760ft/min)
6,000 metres (19,686ft)	... ...	1 min, 50 sec (10,740ft/min)
9,000 metres (29,529ft)	... ...	2 min, 25 sec (12,215ft/min)
12,000 metres (39,372ft)	... ...	3 min, 7 sec (12,630ft/min)

These figures are based on the time from a standing start and include the time required to "unstick" and attain the best climbing speed. The average rate of climb from 10,000ft to 40,000ft was approximately 16,000ft/min.

To recapitulate, although it is possible to climb almost vertically in the Sapphire Meteor, the technique employed was to hold the aircraft down to about 200ft until the best climbing speed was reached, then progressively to steepen the angle of climb while maintaining an air speed of 470 kt up to about 20,000ft. At this height the Machmeter was held at a constant 0.78; and at 40,000ft, just before levelling off, the angle of climb was estimated at 45 deg.

This time-to-height class of record was introduced by the Fédération Aéronautique Internationale during their conference at Stockholm last year. No previous attempt has been made to establish a record for either of the five categories up to 15,000 metres, so credit is due to the Hawker Siddeley Group for their initiative. The Sapphire Meteor first flew on August 14th, 1950, from Hamble, after Air Service Training, Ltd. had installed these powerful turbojets in the Gloster airframe.

It is hoped that the timing equipment which the R.A.E. technicians developed especially for this attempt will be adopted by the F.A.I. for subsequent attempts in this class. It consists, basically, of an experimental radar altimeter suitably modified and installed into the aircraft, together with a 16 mm cine-recording camera. One of the advantages is that it does not suffer from the lag which is usually associated with barometric equipment. After suitable interpolation to account for differences in height between Moreton Valence and sea level, the unit is accurate to within plus or minus half per cent, which is well within the limits stipulated by the F.A.I.

In the air, the equipment was monitored from the control tower to ensure that it was functioning correctly. Frequency signals from the timing unit were received on a tape recorder and compared with signals of a similar character relayed by landline from R.A.E., Farnborough. One of the reasons why the flight took place from Moreton Valence was that, under the orthodox take-off procedure, a sea-level datum was provided by the proximity of the Severn Estuary.

Before the flight, which took place at 7 p.m., two official observers from the Royal Aero Club, acting on behalf of the F.A.I., checked and sealed the equipment. At take-off, one observer stood close to the aircraft holding cords attached to two plugs, one of which, when pulled, started the timing mechanism, while the other switched off a small starting-datum light. With brakes on and throttle open, Prickett signalled that he was ready and the first cord was pulled out. After a slight pause, a green flag was dropped, indicating that the attempt had started, and simultaneously the second plug was removed and the aircraft moved away. The other observer kept a chronometric record of the time from start until the aircraft once more landed and came to rest—a total of 12 minutes—to provide a cross-check with the radar equipment.

From a standing start: F/L. Prickett takes the Gloster Sapphire-Meteor off for its record-breaking climb from Moreton Valence.

MILLIONS IN THE AIR

AMERICA'S highest-ever peace-time defence budget, which has been approved by the Appropriations Committee of the Senate for the 1952 fiscal year, sets aside £3,940 million for aircraft procurement (a term which covers new aircraft, spares, modifications of existing types, guided-missile production, and a number of other items). During the hearing before the committee, however, U.S.A.F. officials estimated that, under the current production schedule, this allocation would not cover a full year's output. It may be necessary, therefore, after a re-examination of the world situation in the autumn, to ask for additional funds.

From the £3,940 million allocation, £1,770 million has been earmarked for the manufacture of 5,064 complete aircraft. This is an increase of £619 million over last year's figure, but a certain proportion of the sum will be used to pay off "instalments" on 3,092 aircraft to be ordered late in the 1951 fiscal year.

A proposal by Carl Vinson, chairman of the House Armed Services Committee, calls for a 163-wing air force in the 1953 fiscal year, consisting of 138 combat wings plus an additional 25 wings for troop transportation. The cost of the additional bases required is expected to be of the order of £143 million, but no indication of the aircraft costs has yet been given. Other moves proposed by Carl Vinson for authorization include the increasing of the Marine air arm to four wings, and the building of two additional aircraft carriers similar to the 59,000-ton U.S.S. *Forrestal*.

It is reported from Washington, incidentally, that the U.S. Navy is considering the construction of an atomic-engined carrier. Work is likely to begin after completion of the atomic submarine now in hand at the Electric Boat Company's yards at Groton, Connecticut. Elsewhere in this issue reference is made to the placing of an order for the construction of an atomic-powered aircraft.

CIVIL AVIATION

HIGHER NORTH ATLANTIC FARES

TRANSATLANTIC passenger fares and freight rates are to be increased with effect from October 1st if agreement is reached between the governments concerned in a new I.A.T.A. rate proposal. The fares will conform to those recommended by the I.A.T.A. Traffic Conferences at Bermuda in May, with the exception that the 17-day excursion rate will be omitted during the first three months of the new year. The basic transatlantic fare would then be $395 (£141) for the one-way flight between New York and London. B.O.A.C. now charges $375 (£133 19s.) There will also be provision for round-trip, off-season and other discounts.

The new agreement provides an interesting commentary on the value of the I.A.T.A. organization which, by quickly arranging and carrying through a mail vote on the new fare resolutions, managed to avoid the "open-rate" situation which would otherwise have arisen on October 1st by reason of the American C.A.B.'s refusal to participate in the deferred "tourist" fare programme on which the other resolutions were based. The C.A.B. disapproved of a Bermuda Traffic Conference resolution which coupled the normal fare-structure with a further provision for the opening of an experimental transatlantic tourist service on October 1st, 1952.

No decision has yet been reached on a course of action to replace the rejected tourist proposal. The question is to be discussed further at a meeting of the North Atlantic operators, to be held in London on September 19th. This meeting will consider various aspects of experimental tourist fares and will also review the airlines' long-range programme for generally reducing the cost of international air transport.

ONE AIRCRAFT, THREE CLASSES

BEGINNING on October 16th, United Air Lines will introduce, on their Pacific Coast route, Stratocruiser flights on which three distinct kinds of service will be offered on the same aircraft. Application has been made to the C.A.B. to authorize three fare-levels, for cabin, tourist and stateroom accommodation, on the daily Mainliner round-trips between Los Angeles, San Francisco and Seattle-Tacoma. This is almost certainly the first experiment of its kind in the history of air transport.

For accommodation on the upper deck of the main cabin, which seats 55, passengers will pay the standard fare of $21.05 between Los Angeles and San Francisco and $42.50 between San Francisco and Seattle-Tacoma; tourist travellers in the lower-deck lounge (seating 14) will pay $17 between the former points and $37 between the latter; and passengers using the luxurious stateroom at the rear of the upper deck will pay the standard fare plus a surcharge of $5 between the first two points and $9 between the second. Meals will be served only to upper-deck and stateroom passengers. Together with "coach" fares, United thus will be offering four different fare-levels on Pacific Coast routes.

Although, at the moment, no similar facilities exist elsewhere, we learn that K.L.M. are planning three classes of comfort in their DC-6Bs and Super-Constellations which are to go into service next year. A suggested layout comprises one cabin with sleepers for 24 first-class passengers, another with limited sleeping accommodation for eight second-class passengers, and a third for 14 third-class passengers with no sleeping accommodation.

B.O.A.C.'S PROFITABLE MONTH

AN indication of the encouraging progress now being made by B.O.A.C. towards eliminating its operating deficit is given by the fact that in July, for the first time in its history, the Corporation showed an overall surplus for a month's operation.

The net profit for July was £202,000 which, after payment of interest on capital amounting to £80,000, left a surplus of £122,000. The four months of April, May, June and July are said to have been by far the best ever experienced. The overall deficit in this period was reduced from £1,748,000 last year to £365,000—an improvement of 80 per cent. At the same time, revenue rose from £7,450,000 in 1950 to £10,500,000 in the period under review. The overall revenue load-factor also increased from 56.1 per cent to 66.2 per cent. Although the total of operating costs is greater this year than in 1950, because of increased output, unit operating costs were reduced from 38.2d to 36.6d per capacity ton-mile.

In announcing these achievements, B.O.A.C.'s chairman, Sir Miles Thomas, pointed out that it was especially gratifying to note an improvement in the results for the South American routes which were causing so much concern last year. Considerably better load-factors are now being achieved in this area.

U.S. CONTROL-OFFICER SHORTAGE

ACCORDING to a statement published by the C.A.A., the present recall of American air traffic controllers to military service is threatening to cause serious breakdowns in the civil air transport system throughout the United States. The C.A.A. has stressed that on no account will the safety standards be lowered even if, in bad weather, it becomes necessary to slow aircraft movements to a fraction of their normal rate, or even cancel flights altogether. The coming winter is expected to bring forth a repetition of the delays and excessive stacking periods which were seen in the immediate post-war period. These were responsible, incidentally, for turning away a great many passengers.

The C.A.A. has admitted that the level of experience among control-tower operators in America's 30 traffic-control centres at 175 major airports has been lowered. Thus far, the C.A.A. has lost 274 reservists out of a total strength of 3,395. In some cases several men have been recalled from a single control point. Fifty-seven of the 60 personnel at Cleveland, for example, are reservists whose recall would present a critical problem. Congestion in such an area might even disrupt traffic 1,000 miles away. Apart from those already recalled, the C.A.A. has another 1,179 personnel on the "reserve" list. A few months ago 73 airline flights were delayed for periods of up to 10 hr because the Fort Worth traffic-control staff had been depleted by reservist recalls.

TWO AWARDS FOR B.O.A.C.

FOR its "great work and success" in building up and operating the North Atlantic air service from 1946 to 1950, B.O.A.C.'s No. 3 Line has been awarded the Cumberbatch Trophy for 1949-50. This decision was reached unanimously by the Guild of Air Pilots and Air Navigators on the grounds that, during the period in question, No. 3 Line had originated and operated North Atlantic schedules without any fatal accidents whatsoever; despite the fact that several different types of aircraft were in use, and that operations were further complicated by the transfer of bases from Montreal to Britain, the unit also achieved the creditable utilization figure of just over 8½ hr per day and a load-factor of 60 per cent.

The Cumberbatch Trophy was presented by Miss Alice Cumberbatch in memory of her brother; it is awarded annually by G.A.P.A.N. for the year's greatest contribution to air safety, and last year was held by the Irish airline, Aer Lingus. In this instance it will be presented by H.R.H. Princess Elizabeth, the Grand Master of the Guild, at a ceremony later in the year.

Coincident with the announcement of the Cumberbatch award, G.A.P.A.N. has also stated that the Brackley Memorial Trophy (for outstanding work in the field of flying-boat operations) will go this year to Capt. H. W. C. Alger, previously manager of B.O.A.C.'s No. 4 Line, which was responsible for the operation of the Solent services withdrawn last year. The trophy was presented by Mrs. F. Brackley in memory of her husband, the late A.Cdre. H. G. Brackley, O.B.E., D.S.O., D.S.C.

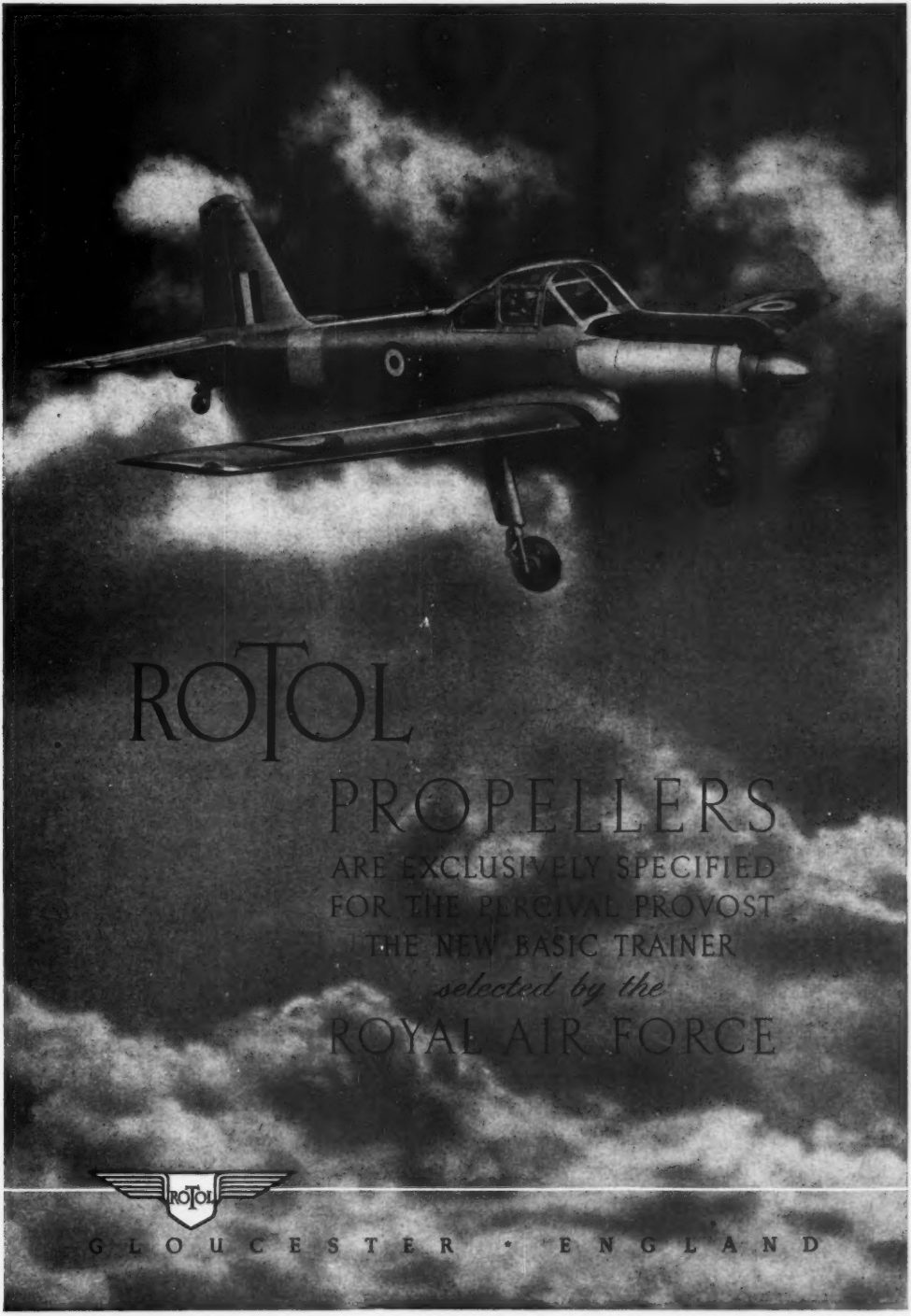
SECOND SOUTH PACIFIC SURVEY?

THE Australian Minister for Air, Mr. William McMahon, has announced that his government is considering the possibilities of a second exploratory flight by Capt. P. G. Taylor across the South Pacific. It will be remembered that Capt. Taylor flew a Catalina flying-boat from Australia to Chile last March. The new flight would probably include visits to Brazil and Argentina.

Capt. Taylor has commented that on his flight in March he was forced to change his plans to fly across the Andes from Chile because bad weather made it impossible to land at Easter Island on the homeward flight. It was most important, he said, that the double crossing of the South Pacific should be made. He believed that there was a trend towards migration from the northern hemisphere to the southern, and it was important that Australia should become the leading influence in that area.

THE COMET ON COMMONWEALTH ROUTES

ALTHOUGH the time for the introduction of the D.H. Comets into regular Commonwealth service is drawing near (the most recent estimate for B.O.A.C.'s first schedule is "early in the new year"), it is, perhaps, still a little difficult to appreciate fully the extent to which the high cruising speed of this type will affect world air transport. As yet no definite cruising figure has been accepted on which schedules can be calculated, but the cruising speed can be said to be roughly double that of existing piston-engine equipment now used on these routes. A good idea of the drastic reductions in elapsed time for flights between points of the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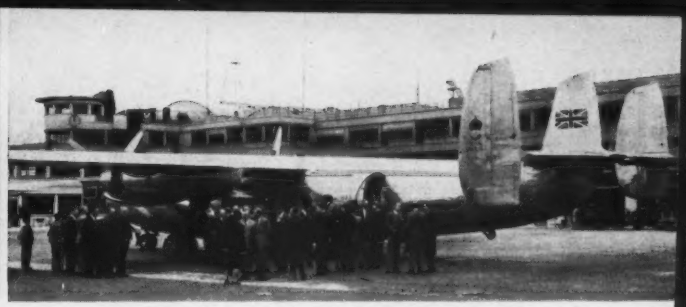

INTO SERVICE: R.M.A. "Elizabethan," flagship of B.E.A.'s new Ambassador fleet, has already started its career as a Corporation breadwinner. For an initial period of six weeks it is replacing a scheduled Viking on ordinary services between London and Paris. We publish here two informal photographs taken during the final proving flight on September 1st, when the "Elizabethan" carried a number of leading personalities in British civil aviation. (Left) B.E.A.'s chairman, Lord Douglas of Kirtleside, enjoys a brief interlude in the cockpit with Capt. "Bill" Baillie, who is in charge of the Corporation's Elizabethan Flight. (Right) A general view of passengers disembarking on arrival at Le Bourget.

CIVIL AVIATION...

British Commonwealth, and of the implicit changes in airport organization, can be obtained from the table below, which has been designed to show at a glance the comparative journey times for flights between major cities.

The first figure in each space shows the shortest airport-to-airport travel time in hours between various points, with the general direction of the quickest route indicated by arrows. Figures in bold type are the estimated journey-times which would be taken by the Comet. It should be noted that, as a large proportion of time is at present occupied by waiting or sleeping at intermediate airports, the corresponding Comet times (based on an estimated cruising speed of 430 m.p.h.) will effect the greatest savings—nearly 50 per cent—over the shorter distances. On the longer journeys the saving will be about 30 per cent. The compiler of the table has admitted, however, that his estimates are on the conservative side because he has ignored the fact that the increased flying speeds will almost certainly enable one night stop to be cut out on most of the longer journeys.

The first two companies to introduce the Comet will be B.O.A.C., who will use them on their London-Australia and London-Johannesburg routes, and Canadian Pacific Air Lines, who will fly them on the Canada-Tokyo service.

From \ To	VANCOUVER	MONTREAL	LONDON	CAPE TOWN	JO'BURG	CAIRO	CALCUTTA	SINGAPORE	SYDNEY	AUCKLAND
VANCOUVER		13	29	99	81	55	73	64	40	39
		7	**17**	**78**	**61**	**34**	**57**	**41**	**26**	**24**
MONTREAL	14		12	83	63	33	52	70	64	74
	7		**6**	**67**	**49**	**22**	**35**	**60**	**42**	**40**
LONDON	36	16		48	28	11	31	48	83	84
	18	**6**		**38**	**21**	**6**	**20**	**34**	**63**	**53**
CAPE TOWN	87	67	48		4	51	81	89	127	150
	59	**47**	**36**		**2**	**42**	**64**	**69**	**99**	**121**
JO'BURG	70	50	30	4		37	64	72	110	133
	44	**31**	**19**	**2**		**27**	**47**	**53**	**82**	**103**
CAIRO	51	31	12	59	39		17	26	63	86
	21	**16**	**7**	**49**	**31**		**11**	**16**	**46**	**69**
CALCUTTA	73	53	34	90	71	21		9	45	68
	43	**30**	**21**	**71**	**53**	**12**		**4**	**34**	**57**
SINGAPORE	68	75	61	105	86	36	8		22	45
	47	**52**	**43**	**78**	**66**	**25**	**4**		**14**	**33**
SYDNEY	40	64	80	142	123	74	45	22		7
	30	**46**	**53**	**95**	**77**	**36**	**33**	**13**		**3**
AUCKLAND	56	74	78	153	134	84	56	34	7	
	28	**44**	**52**	**115**	**98**	**53**	**41**	**22**	**3**	

Comparative journey times (hours) between major cities on the air routes of the British Commonwealth are shown for existing airline schedules (in ordinary type) and for estimated schedules when D.H. Comets are brought into service (bold type below arrows). The arrows give an indication of the quickest direction of travel (east or west). Drawn by Mr. F. B. V. Botley, B.A., F.R.G.S., the table is reproduced from "New Commonwealth".

T.E.A.L.'S ANNUAL RESULTS

In announcing the operational results of Tasman Empire Airways, Ltd., for the year 1950-51, the chairman, A.V-M. Sir Leonard Isitt, discloses the fact that, despite a substantial rise in costs last year, the company showed a profit of £16,591. After taking into account interest on loan capital there remained a net profit of £781.

Recent increases in fares, the greater volume of traffic which has followed the Korean emergency, and an expansion of the company's services in the Pacific area, should show up T.E.A.L.'s finances in an even better light at the end of the present financial year. It is worthy of note that the passenger-rate for the trans-Tasman flight is one of the lowest in relation to comparable international services.

On nine trans-Tasman services weekly, as well as a number of schedules to various Pacific islands, the company now has a turnover of over one million pounds. A fifth aircraft will shortly augment the fleet and Pacific routes will then be opened, stretching east to Tahiti. The unduplicated mileage of the company's network will total 8,549 miles. Operations have now been carried out for over eleven years without a major mishap of any kind.

AIRLINE LIABILITY

I.C.A.O.'s Legal Committee will meet in Madrid this month in an attempt to revise existing international laws which limit the liability of airlines for damage caused by accidents in which their aircraft are involved. The main purpose of the meeting will be to discuss the liability laws as laid down by the Warsaw Convention of 1929. Several member-nations are understood to favour doubling the present limit, which has been set at $8,291 (£2,961).

GEMEAUX RESEARCH PROGRAMME

THE Fouga Gemeaux III, which is the flying test-bed for the Turboméca Marbore Mk II gas turbine (of 780 lb static thrust), made its first flight at Aire-sur-l'Adour on August 24th. The pilot was Léon Bourrieau, who (as reported in *Flight* last week) made the initial flight in the CM.101.R "mixed-power" transport on the previous day. There are actually five prototypes in the present Gemeaux series, the construction of which was undertaken to provide means for airborne research on various wing profiles and to study radio-activity at high altitudes; they will also be used for rain-making experiments.

The three Gemeaux machines which have flown to date, the Marks I, II and III, are powered, respectively, by two Piménés, a Marbore I and a Marbore II. The Marks IV and V, which have not yet flown, are to be powered by the double-flux Aspin I (of 530 lb static thrust) and Aspin II (730 lb).

A PHOENIX ARISES

AN announcement made in Germany on September 5th shows that the Western Powers are gradually handing over ground control of civil aviation to the local authorities. The West German Government has established a special section of its Ministry of Transport to take over the non-flying functions of the Allied Civil Aviation Board. The Board will progressively hand over the running of departments concerned with air-traffic control, navigational aids, airport supervision, aeronautical information, accident investigation and telecommunications.

CIVIL AVIATION...

According to informed sources, the Allies themselves have not yet been able to reach agreement on the actual date on which the security ban on flying is to be lifted. Meanwhile, German gliding activity is already in full swing (see *Flight*, September 7th) and, no doubt, designers are already at work on plans for a number of powered light aircraft.

It is doubtful whether, in her present economic position, Germany would be able to carry out the construction of any large or competitive civil machines (except under licence from foreign manufacturers); but there is believed to be enough money, initiative and interest in flying in Western Germany to bring forth several interesting sporting prototypes in the immediate future. In that event, and if the rapid progress made by the German gliding movement since the lifting of the ban on its active existence is any criterion, European air-racing enthusiasts may in due course be faced with strong German competition comparable with that of the years just before the war.

BREVITIES

DENMARK has accepted an invitation from the British Government to send a delegation to London to discuss Anglo-Scandinavian aviation problems.

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Following a year's trial with the American type of "flight progress" board used in control towers, the Australian Department of Civil Aviation has decided that this system will now be brought into full-scale use throughout the Commonwealth. Similar equipment is in service at London and Northolt Airports.

* * *

The Ceylon Government has decided to grant commercial rights to K.L.M. as soon as a new runway has been completed at Ratmalana airport, ten miles from Colombo. The agreement will probably be signed when Ceylon's Minister of Transport, Sir John Kotelawala, visits Holland shortly.

* * *

An "eternal triangle" problem has been posed for the U.S. Civil Aeronautics Board, which has to decide whether Northeast Airlines are to merge with Delta Airlines or National Airlines. National has strongly opposed the Northeast/Delta merger plan as it considers that a National/Northeast combination would be a more logical solution.

* * *

Canadian-Pacific Airlines has become the twenty-second operator to select DC-6Bs as replacements for existing equipment. The company has ordered three 50-passenger versions, each equipped with a private stateroom in the forward section. The main cabin will have 42 sleeperette seats, a buffet, cloakroom, lounge and small cocktail bar. The company will use the machines on its trans-Pacific routes; delivery is scheduled for late 1952.

* * *

It has been stated in Sydney by A.V-M. Sir Leonard Isitt, on behalf of B.C.P.A., that his company could maintain adequate temporary passenger schedules if B.O.A.C. and Qantas services have to be cut because of oil shortages in India and Pakistan. If necessary, he said, B.C.P.A. could fly an additional return service weekly to the U.S. and Canada from Australia, as well as other Pacific and Atlantic schedules.

* * *

After several years of negotiation in the post-war period, it now appears that K.L.M. may resume its service between Amsterdam and Sydney. The leader of the Dutch delegation which has just visited Australia for talks on the subject expressed the hope that the first weekly service might start in November. Formal conclusion of the agreement reached between the two governments is expected to follow shortly.

ON PARADE: These three variants of well-known Miles products were spotted together by "Flight's" cameraman on the airfield at Redhill recently. They are (left to right) the Mk II Gemini (125 h.p. Continentals), Mk VI Aerovan (195 h.p. O-435A Lycomings) and the Aries (155 h.p. Cirrus Majors). The last-named machine, incidentally, is reported to have a single-engine climb of 300ft/min with four up.

Q.E.A. have added two 30-passenger ex-B.O.A.C. Short Plymouth flying-boats to their fleet; they will be used on the Noumea, Fiji and New Hebrides services. Plymouths have a normal range of 2,000 miles and cruise at 150 m.p.h.

* * *

American airlines taking part in the Korea airlift have been told that although the U.S. Military Air Transport Service will continue to use 60 of their airliners, several companies may have some of their aircraft returned to them to help in meeting the summer traffic peaks.

* * *

Trans-Canada Air Lines announce the appointment of Mr. W. Gordon Wood to be vice-president in charge of traffic. He will be responsible for development of the company's passenger, cargo and air express traffic and will also present T.C.A.'s viewpoint at I.A.T.A. conferences.

* * *

Next month Sabena will open a new service between Costermansville (Belgian Congo) and Dar-es-Salaam (Tanganyika). Flights will be made weekly with DC-3s *via* Albertville and Tabora. Sabena's operations in the Belgian Congo, incidentally, already constitute the largest colonial network in the world (12,500 miles).

* * *

K.L.M. have announced that sales in the first half of this year were 26 per cent higher, and productivity 22 per cent higher, than in the corresponding period of 1950. Apart from the cancellation of special flights to the Far East and Australia which have followed the Persian oil shortage, prospects for the second half of the year are said to be favourable. The number of emigrant flights to Canada was recently increased to a frequency of ten flights a month.

* * *

For the part which it played in re-establishing vital radio services at Palisadoes Airport, Jamaica, following the recent hurricane, International Aeradio (Caribbean), Ltd., has been officially thanked by the Governor of the island and by the Secretary of State for the Colonies. Although the terminal building and the control tower were completely destroyed, two tower frequencies and four air-to-ground and seven point-to-point circuits were working within two days of the disaster.

* * *

California Central Airlines has purchased five Martinliner transports to replace the DC-3 and DC-4 equipment which the company has used for the past few years. The acquisition of the new machines will make C.C.A. the first American scheduled inter-state operator to be equipped with 300-m.p.h. aircraft. The provision of fast, high-capacity equipment is of particular importance to C.C.A. as the company is dependent entirely on its passenger revenue, having no mail or other subsidies to supplement its income.

* * *

Speaking in Edinburgh at the recent congress of the British Association for the Advancement of Science, the Director-General of I.C.A.O., Dr. Edward Warner, expressed the opinion that the cost of air travel would have to be reduced to 1d. or less per passenger-mile if aircraft were to be used in future to extend the suburban radius of metropolitan communities up to 100 miles or more from Britain's larger cities. If the cost of travel were 4d. per mile (somewhat below present European air-travel rates) the cost of a 100-mile journey from home to office would be something over £3 per day.

THE WELL-TEMPERED AIRCRAFT

39th Wilbur Wright Memorial Lecture: A Notable Address

OF the few thousand men in the world who have real technical ability and experience and, therefore, can be reckoned to have something to say to their fellow workers, no more than a few hundred have the ability to put their ideas into clearly arranged words. Of these few hundreds, a few score have the refined ability so to arrange their words as to give a strikingly lucid exposition of their ideas. But rare indeed is the man who not only draws a lucid picture but manages to make it entertaining as well. Such a man, however, presented the Wright Memorial Lecture this year. Mr. Arthur E. Raymond, Vice-President, Engineering, Douglas Aircraft Co., gave a brilliant review of what an aircraft should be—and many of the difficulties in the way—when, last Monday, September 10th, he read his paper, *The Well-Tempered Aircraft*, before the Royal Aeronautical Society assembled at the Royal Institution in London.

Mr. Raymond observed that the Wrights built and flew their aeroplane successfully because, among other things, they saw the problem as a whole, saw its elements in proper relation to each other, gave to each the attention it deserved, and overlooked nothing. Today, although the problem had become enormously more complex, the greatest success came from the same approach. It did not pay to be too theoretical or mathematical, it did not pay to stick too closely to the drawing board, nor could individual judgment alone be relied upon. A proper combination of these and many other elements was necessary.

The task today was to produce a large number of good aircraft with the least expenditure of cost and time. The resources of Great Britain and the United States were limited and had to be used as effectively as possible. By good aircraft was meant aircraft that contributed more to society than they cost. The lecturer then listed eight fundamental elements which, although not necessarily all-inclusive, appeared to be essential to the production of operationally-useful aircraft. These were: (i) proper environment; (ii) good initial choice; (iii) excellence of detail design; (iv) thorough development; (v) follow-through; (vi) thorough exploitation; (vii) correct succession; (viii) adaptiveness. These fundamental elements were then considered in turn.

Proper Environment.—The first item Mr. Raymond dealt with under this head was confidence, and he said that confidence had to be transmitted to others, and among the first who needed to be convinced were those who put money into the project. An aircraft could never be proved a success until its development period was behind it, but on the other hand, until its success had been reasonably established, it was difficult to get people to buy it. Unfortunately, the greatest need for funds tended to come at a time when troubles were most likely, i.e. the early production period (Fig. 1). Many a successful aircraft was built under great physical handicaps, and it certainly could not be proved that good working conditions were imperative. The human spirit often triumphed over obstacles, but that fact was not necessarily a good excuse for having them.

The supply of properly trained and experienced personnel was not enough to meet the demand; the work of every man had to be made to count to the maximum degree. In the design organization, two types of co-ordination had to be provided for, co-ordination by speciality, and co-ordination by project (Fig. 2). Which of these systems was the better was a subject for argument, but it made little difference which was used; they would both work. The important thing was that one or other had to be given preference when it came to administrative authority, and everyone should understand where the preference lay.

Concurrently with the great elaboration of aircraft design had come a narrowing of the designer's horizon, and this narrowing took away much of the feeling of identity between a man and his work—the day of the specialist was here, perhaps even more in the United States than in Great Britain. Everything possible should be done to ensure that the engineer and designer on the one hand, and those who would manufacture and use the aircraft on the other, understood and considered each other's viewpoint.

Good Initial Choice.—Mr. Raymond gave an explanation of how some aircraft had come into being. Someone had become convinced that there was need for a machine of such and such a type; he marshalled a few arguments, convinced someone else and the ball was rolling. As it gathered momentum, arguments in favour were high-lighted, arguments against were stepped on, personal pride became involved, people became committed, and sober analysis of pros and cons became impossible. The project went ahead, the aircraft was designed, built and flown—usually rather successfully—and then what happened? Nothing. Because nobody really wanted it or because those who might have wanted it wanted something else besides. Obviously a project would be doomed from the start if it did not fill a real need.

There were two sides to the question of deciding what to build: one was *what was needed*, the other was *what was possible*—what *should* be built versus what *could* be built. These had to be considered separately and in relation to each other if the choice was to be a good one. The establishment of a sound realistic set of military requirements, for example, was a high art demanding the pooling of experience, analytical skill and judgment of people with widely varying background. The kind of fighter needed five years from now depended not only upon the materials, engines, radar and armament that would be available by that time, but also upon the characteristics of enemy bombers and fighters then, and the tactics they would employ. It depended, moreover, on the amount of money which could be spent on fighters in relation to what was spent on other things. It depended on how good other methods of defence, such as missiles, would be by that time. In other words, it depended not only upon the fighter itself, but upon the whole defence system of which the fighter was a part. The same could be said of any other military aircraft.

That part of the problem of initial choice which had to do with determining what was technically feasible was often called "limitations analysis." One of its end points was a curve on which was plotted against gross weight and wing area a series of curves of various constant performance characteristics. There resulted a shaded area which defined the combinations of gross weight and wing area for a given aircraft configuration that had performances better than certain prescribed values (Fig. 3). Such curves could be prepared for several configurations, and thus could assist in choosing between them. Limitations analysis was really a partial definition of what was commonly called "the state of the art," the level reached by the constantly rising progress curve. An aircraft designed in such a way as not to take reasonable advantage of the state of the art was handicapped competitively; one designed too far in advance of it with too much optimistic anticipation ran into the dangers inherent in all pioneering efforts.

This did not necessarily mean that design should not be in advance of the state of the art, but it did indicate the importance

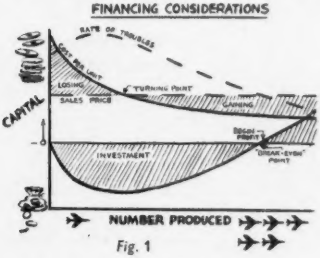


Fig. 1

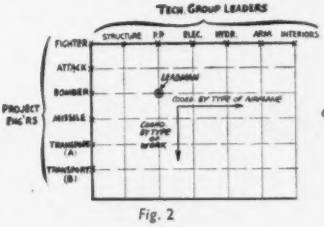


Fig. 2

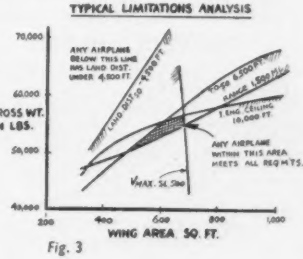
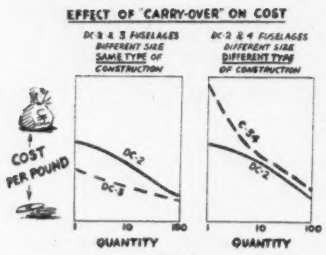


Fig. 3



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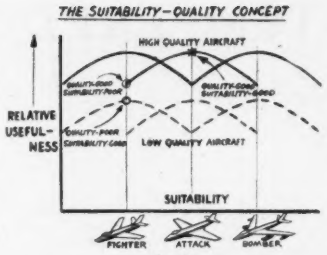


Fig. 5

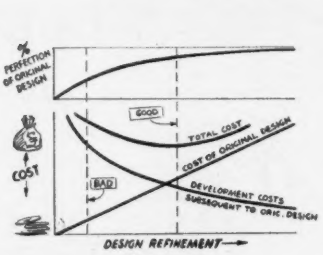


Fig. 6

THE WELL-TEMPERED AIRCRAFT . . .

of keeping one's eyes open to the resulting dangers. If, instead of aiming too high, a conservative approach was adopted, a number of advantages became immediately apparent. Experience of past designs could be carried over into the new one with little or no change. The assurance of having a design which would require little development often made it possible to start production before the prototype had been tested, thus shortening the elapsed time before the aircraft came into the market. With a civil transport aircraft, near conventionality made passenger acceptance more sure, and made operators more willing to order while the aircraft was in the blueprint stage—and the manufacturer more willing to accept such orders. All of these things made it appear more attractive to do what had been done before, but in a slightly different way, rather than to branch out into something new. On the other hand, such an attitude if carried to extremes stifled progress and, since there were many adventurous spirits in aviation, and always would be, it led to being over-run.

On the whole, "carry-over" had such a great effect on aircraft cost that it would have to be retained as a nucleus around which a few pioneering electrons revolved (Fig. 4). Doubling the number of aircraft produced cut their unit cost by about 20 per cent. Since versatility extended the market, there was a continual temptation to combine two or more requirements into one multi-purpose design. If the requirements were sufficiently similar, this could be done satisfactorily; if they were too far apart, the result was a product which really satisfied no one. It was particularly true of civil transports that, unless the market was extensive, the unit cost would be too high to be borne. Too great a degree of specialization could not be supported.

Excellence of Detail Design.—Two aircraft designed to the same specification might differ widely in size, cost and weight, simply because of the relative quality of detail design (Fig. 5). In fact, thought Mr. Raymond, much of the progress being made in the art consisted in learning how to design a small, efficient aircraft to do the job previously done by a large complicated one. Not only did this hold true of the aircraft as a whole; it was also true of its components down to the smallest parts. It was not always appreciated that a pound saving in weight empty might be compounded into ten or more pounds saving in gross weight on modern designs.

Carry-over of learning from previous designs was a major aid in reducing troubles in service. A design developed from a previous design, if the basic principles were still correct in the new application, was usually better than a completely new one. It took engineers a few hard knocks to make them realize this; some never did. An engineer liked to take pride in a new and original design; he got more satisfaction from this than from improving an existing one. It was a problem in psychology to get designers to take pride in the reliability and trouble-free operation of their production, rather than in the originality of their concept. On the other hand, using an old design in new conditions to which it was basically unsuited could be equally as bad.

When refinement of design was carried on with the idea of making it more nearly perfect, making it meet requirements more exactly, it often resulted in more complication, higher cost and, in general, a poorer overall design. This was the disease referred to as "perfectionism." Complication was sometimes the path of least resistance for the designer. It was either the result of lack of knowledge or lack of adequate thought. The simple way of doing something was not usually one that sprang first to mind. Designing to a fixed budget rather than for a certain level of excellence could result in a spotty combination of good and bad elements. Designing to a fixed budget might be good if the budget was properly set. If, however, it was too low, the result was illusory, for whilst the cost of the original design was kept down, costs of the subsequent development necessary to reach an acceptable level of perfection were higher (Fig. 6).

Another quality which carried through all the way from the general arrangement of an aircraft to the detail design of its components was ability to absorb future technological improvement. A long view was required to sacrifice immediate advantage for the benefit of longevity. A good aircraft might be in service for ten years or more, and it was wise to keep its growth possibilities well in mind from the beginning. The aeronautical profession, thought Mr. Raymond, was beset by stylists and faddists. Proper functioning was more important than style or appearance, and the designer who attempted to force his brain-child into a form which satisfied his æsthetic sense at the expense of its performance or flight characteristics, had not done a good job. Premature enthusiasms and *a priori* conceptions had to be rigidly put to one side if a well-tempered aircraft was to be achieved.

Aircraft production at best was not high-volume production, and the type of tooling required was not high-production tooling. This lesson had been learnt the hard way by the motor industry during the recent war. Considerable progress had been made since aircraft were made by hand with little or no tooling, and the correct middle course was to provide comparatively simple tools which could be augmented or duplicated if production was stepped-up, and which could be thrown away if the design was changed. This type of tooling often dictated the design. The true producibility of a design, as that term should be used, was the degree of its adaptability to the use of this type of simple tooling (Fig. 7).

Development.—It was the lecturer's opinion that there should really be more than one prototype, not only because of the vulnerability of putting all the eggs in one basket, but also in order to shorten development time by running tests in parallel. Experience had shown that, normally, it took at least as long to perfect a design after first flight as the time that had gone into it before the first flight. Flight test time was expensive, particularly on modern aircraft, but it could be shortened by suitable preliminary research and ground or laboratory testing, including wind tunnel testing.

One of the difficulties of model testing was the time required to build models and to test them. The high forces imposed on models in high-speed tunnels demanded model construction so

Fig. 7

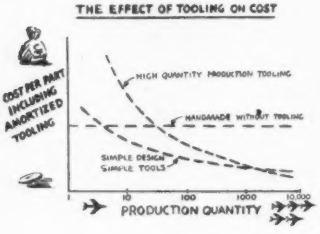
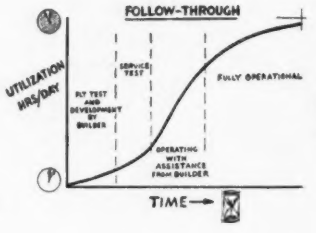


Fig. 8



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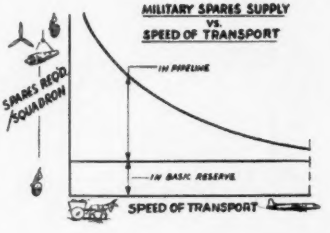

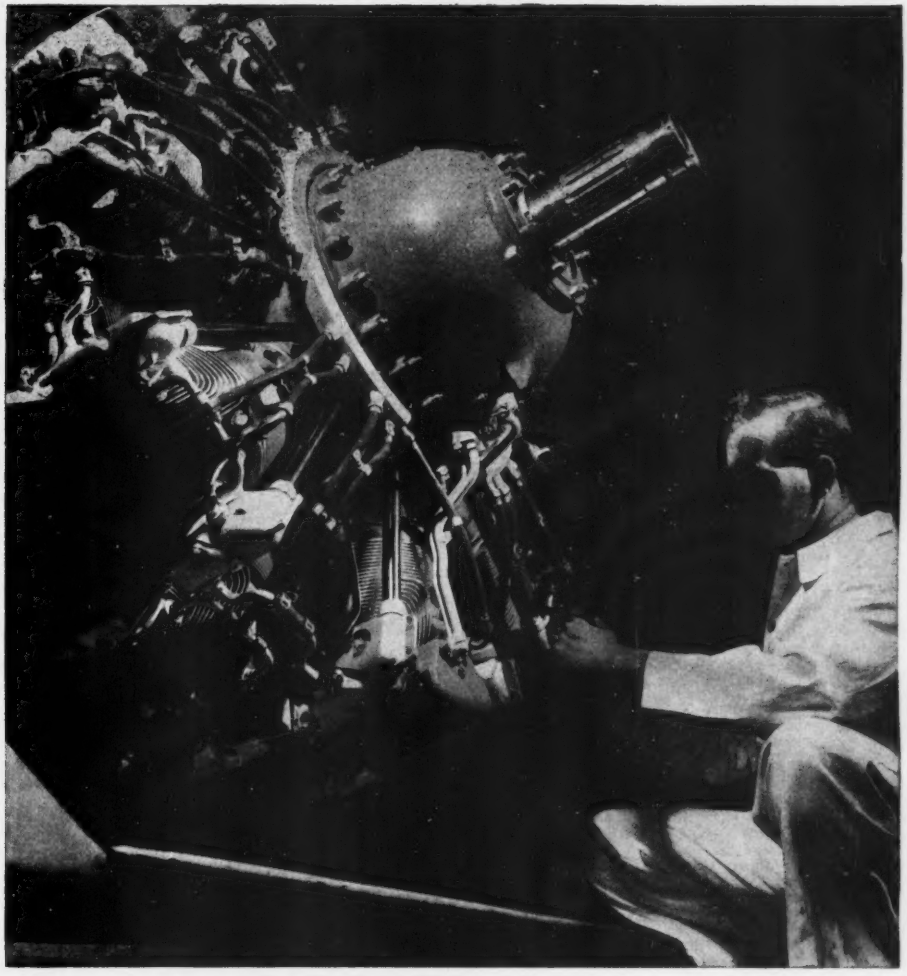

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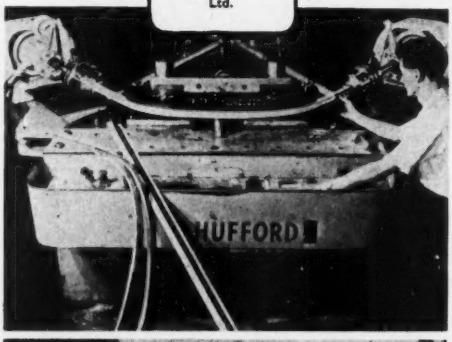
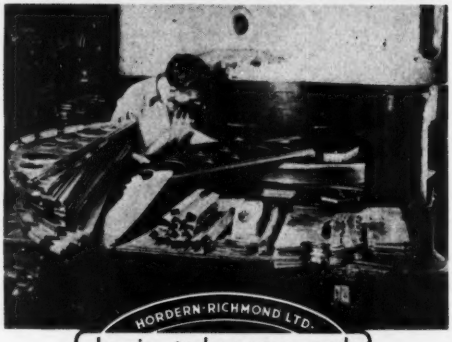
Hawker Sea Fury and Sea Hawk production. Photographs by courtesy of Hawker Aircraft Ltd.





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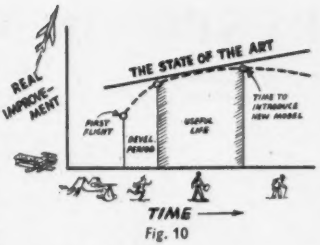


Fig. 10

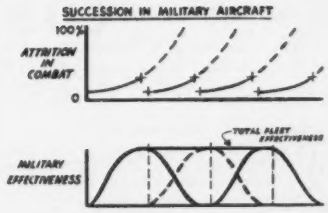


Fig. 11

intricate and test programmes so long that it was difficult to get tunnel results early enough in the design of the aircraft to allow design modifications to be made while the drawings were fluid. In these circumstances, the wind tunnel tended to become a checking device rather than one for the collection of design information.

Aircraft design was not a complete science and never would be, so flight tests and service experience were necessary in order to check what had been done on the drawing board and in the laboratory. The aircraft was, first of all, a flying machine, and there was no substitute for good flying qualities. A good flying aeroplane had to be obtained first of all; the rest could be added later. In a sense, however, the development never ended, for so long as the aircraft lasted, improvements would be made in it. What was aimed at in the development period was to get the aircraft into such shape that it could go into service and do its job month in, month out, and average not less than, say, five and perhaps as many as ten or more hours of flying time per day. If it could do that, it was a well-tempered aircraft and justified its existence.

Follow-Through.—At completion of the development phase, the aircraft passed from builder to operator. This transition could be made easier if key-men from the operating side were brought into the factory some time before delivery, to become familiar with the aircraft and to share in its test programme. There was a tendency to criticize a new aircraft, if it was not fully understood. It might be much better than previous types but, just because it was different, it would at first seem strange and uncomfortable. An easy affection came only after long familiarity and the period of becoming acquainted with something new could be very awkward f a well-thought-out and organized programme was not put into effect to bridge it over (Fig. 8).

On the subject of spares, Mr. Raymond said that nobody knew ahead of time exactly what would be needed, but the spares situation for the civil operator was a good deal better than in the military case. Spares for military aircraft were often badly handled; large surpluses and acute shortages went hand in hand. The nature of military operations made the problem of spares particularly difficult, but the supply problem could be simplified by the use of air transport (Fig. 9).

Thorough Exploitation.—Mr. Raymond expressed the opinion that a well-conceived well-executed and well-developed aircraft could usually be adapted to a wide variety of uses over a period of years, so extending its market and lengthening its life-span. It had been estimated that successful military aircraft underwent, on the average during their useful life, modifications totalling at least one-half of their original cost. The record for successful civil aircraft was much the same, for these found their way to many different customers, each of whom required variations to meet special preferences or conditions of operation.

There was little use bewailing this tendency toward non-standardization. Modifications undoubtedly added to the cost, but without them the number of aircraft produced would be many less which, in itself, would probably raise the unit cost even more.

Correct Succession.—Regardless of how good an aircraft might be, there came a time (and it might come imperceptibly) when it became uneconomical to continue production. Any further modifications would cost more than their benefit (Fig. 10).* This was the time when a new model should be through its development phase and ready for operation. The new model must, therefore, have been started several years before. It was not enough to acknowledge the point of obsolescence when it occurred; it had to be foreseen considerably in advance.

The problem of succession when applied to military aircraft had some special elements which were worth noting. The losses that a given air force would sustain in battle against the enemy depended on its quality. If aircraft were not replaced from time to time with newer models, their attrition rate would be higher in the event of war. Replacements in wartime would then have to be more numerous (leaving aside the difficulty of getting them in time) and their total cost would be higher. This added cost would tend to offset the added cost that would have been incurred had more modern aircraft been secured in the first place. Mr. Raymond then made the trenchant observation that the penalty of allowing an air force to slip behind the state of the art through failure to renew was so great that a drastic policy of scrapping existing military aircraft and replacing with new ones as soon as they could be made available would pay in the long run. In other words, as soon as today's bomber or fighter had been placed in production, tomorrow's should be started on the drawing board (Fig. 11).

Adaptiveness.—There had always been a great many people in the aircraft business whose attitude was optimistic and who expected the best. Many projects would never have been started had this not been so. A surprisingly large proportion of these had been successful, when a careful and thorough preliminary analysis would have shown their chances to have been much less than even. If no one drilled an oil well unless he were absolutely sure he would strike oil, petroleum production would be much less than it was. Certainly, there were times when it was justified to take-chances.

The qualities of mind referred to, flexibility, optimism, and lack of caution, were youthful qualities. Aviation would undoubtedly always be a field which attracted young men, and one which was benefited by their presence. Those who had been in it a good many years might be able to supply the tempering judgment which only experience could bring, but they could not allow themselves to think that they had all the answers.

To illustrate the importance of the unplanned-for element, Mr. Raymond concluded his lecture by quoting the case history of the Dakota. What it amounted to was that the DC-3 had been lucky enough in its early years so completely to capture the market (and this had not been the result of particularly good planning) that competition was thrown off balance. It therefore had had the benefit of a rather unique position, but the fact remained that stern realism undiluted by a certain light-hearted assumption of risk might well have damped the project in its early stages.

AN AIRLINE'S QUARTER-CENTURY

"High Horizons," by Frank J. Taylor. McGraw-Hill Book Co., Inc., 330, West 42nd Street, New York. Price $4.00.

LATEST addition to the fast-growing library of company histories is this story of United Airlines, who celebrated their 25th birthday this year.* The sub-title "Daredevil Flying Postmen to Modern Magic Carpet" gives a clue to Mr Taylor's picturesque, American style of writing, which may cause the more conservative reader to squirm occasionally, but, on the whole, is highly entertaining and descriptive Take, for example, this story of one of the "Daredevil Postmen" in his war-weary D.H.9 mailplane in 1921 : "Pilot J. Dean Hill, when he left Bellefonte, invariably lighted a long cigar and puffed leisurely as he flew. When the stogie burned down to two inches in length, he figured it was time to come down over the Jersey meadows. Hill always claimed that his stogie was the first instrument to aid commercial fliers."

Whether or not that conforms with the reader's idea of great English prose, *High Horizons* is worth a place on every aviation bookshelf. Beginning with the individual stories of Varney Airlines, Pacific Air Transport, Boeing Air Transport and National Air Transport—the four companies which combined to form United Airlines in 1929—it shows how they survived years of big business, political manoeuvring and financial crises to become the great free-enterprise Main Line system of today, carrying 2½ million passengers a year on 13,000 miles of routes.

We read how United pioneered a brand-new profession by taking on the first air hostesses in 1930, and then began the modern mania for red carpets, free meals, orchids and champagne by serving the first in-flight meals to their passengers. Some bright ideas misfired : for instance, after introducing a scheme by which wives could accompany their husbands free of charge on certain flights, United's sales staff wrote to ask the ladies if they had enjoyed the trip. Unfortunately, it transpired that at least one husband had neglected to tell his wife that he had taken her along !

It is a fascinating book, because many of the "great names" in American aviation had a hand in building United Airlines. But more than 94 per cent of United's present top management people came up the hard way in the company's offices and "off the ramp," and Mr. Taylor pays well-merited tribute to them also.

* *See "United is Twenty-five", "Flight", March 9th.*

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Tomorrow's Trainers

IN your leader of August 24th it is suggested that the question might be asked: "What can Balliols do in the way of advanced training that Vampire Trainers cannot do better?"

Earlier in the same paragraph you refer to the Vampires as operational trainers, a role that is comparable with that of the two-seat Meteors.

It is presumed that the word operational in this case means training in the operational role specifically associated with this class of aircraft, whereas the major part of "advanced training" is concerned with instruction in all operational aspects of aircraft as a military weapon, i.e. the use of offensive and defensive armament, reconnaissance, navigation, etc.

Such training can, surely, be given more economically and affectively in a type of aircraft specially designed for the purpose, and, in the present state of technical development, can certainly be given more cheaply on aircraft fitted with low-rated piston engines than on those with jets.

The time may come when the balance of advantage in cost and effectiveness of training may change in favour of a jet-engined aircraft specially designed to fulfil the advanced training role and to carry the diverse and alternative equipments which the modern Service pilot has to learn to use.

In my opinion no such aircraft exists today, but the P.119 project described in your issue of August 31st seems to provide an economical and effective answer.

London, S.W.1. L. M. ILES, A.V-M. (ret.).

Delta Aerodynamics

I WAS rather surprised by a statement appearing in Mr. Ewans' article, "Aerodynamics of the Delta" (*Flight*, August 10th). In the first paragraph on p. 173 I read: "As air flows past a wing its speed is increased over the upper surface to a considerable extent and over the lower to a lesser extent, so that there is a greater suction on the upper surface than on the lower surface."

Until reading this, I was under the impression that the fundamental explanation of lift involved the consideration of the superposition of streaming flow past an aerofoil and circulation round it, giving rise to increased speed over the aerofoil and *decreased* speed below it. By Bernoulli's Theorem these perturbations of speed can then be related to a decrease of pressure above the aerofoil and an *increase* of pressure below it.

I should, therefore, welcome some expansion on this subject by Mr. Ewans, or other of your more technically-minded readers.

Incidentally, should not the fourth "delta" in the list at the commencement of the article read XF4D-1, XF3D-1 being the Skynight, a twin-jet night fighter?

London, W.4. T. S. R. JORDAN.

[Yes, XF4D-1 is the correct designation.—ED.]

Piscatorial Aeronautics

AS it takes some time for my copy of *Flight* to penetrate as far as Swaziland, I fear I may be rather late in presenting my observations on flying fish (article by L. W. Crawford, July 27th). However . . .

I also spent days watching flying fish doing their version of "circuits and bumps" and, unlike Mr. Crawford, came to the conclusion that their flight was not powered—despite the apparently extraordinarily small angle of glide which both Mr. Crawford and I observed. The gliding angle relative to the horizontal is virtually zero, but I suggest that the angle of glide relative to the direction of the air stream is much greater. Did Mr. Crawford notice that the fish flew only when there were moderate wave conditions? It seemed to me that they got most of their lift from the up-currents at the wave tops, which enabled them to keep airborne over the troughs.

"Wing" vibrations, or flutter, I did see, but I interpreted this to be a result of turbulence over the wing surface when the angle of attack changed from positive to zero (or even negative) as the fish moved almost horizontally through an undulating air stream.

There is, however, a form of propulsion once the fish is airborne —particularly with *Exocœtus*, which has a fairly well-projecting lower portion to its rudder. One notices this lower rudder breaking the surface on wave tops and waggling violently, so boosting the speed just as maximum-lift conditions are provided by the upward air current. Changes in direction also follow the use of this sea-rudder.

I doubt if the ability to alight on a ship's deck is "unquestionable [evidence] that they must use power for flight"; the fish that I saw came aboard from the weather side of the ship, assisted, I submit, by the general turbulence and up currents of air passing over the vessel.

On one point Mr. Crawford and I agree: the biological gentleman's "parachute" theory is a little difficult to accept, but maybe he, too, was thinking in terms of the fish making the maximum use of up-currents.

Mbabane, Swaziland. G. DENNIS GILBERT.

Rearward-facing Seats

YOUR correspondent Mr. J. Scott (August 24th) appears to have the opinion that "advocates of rearward-facing seats" believe them to immunize the passenger from hurt in any type of crash.

Of course, this is not so, but if anyone with a slight knowledge of dynamics would show him the effects of a body in a forward, then a rearward-facing seat during a sudden deceleration, he would then become an "advocate of rearward-facing seats," especially if he were that body. We know that a rearward-facing seat is of no more use than a wicker chair in a crash from any altitude; but for emergency landings, such as "wheels up," they are of great value to human lives.

Mr. Scott also writes that advocates of rearward-facing seats are inclined to quote accidents which support their case; be this as it may, the only crash with which he backs his case possibly happened after the original letter from Mr. J. Howard had been written and published.

Warminster, Wilts. G. NORRIS.

Airfield Fires

WITH reference to "Enquirer's" letter (August 31st), recorded instances of lives being saved from severe aircraft crashes at civil airfield are few, but do exist. The reason there are not more is due mainly, outside most M.C.A. and a very few overseas international airports, to the inadequacy of equipment and training facilities and the apathy of airport operating authorities towards the problem.

The really severe high-speed impact-crash fire, either on or off the airfield, is always a difficult problem, but there are numerous cases where prompt action by efficient crews and apparatus on small to medium fires has undoubtedly prevented a major fire developing within a few seconds and has enabled passengers and crew to get clear safely or to be rescued. Conversely, there are other cases where initially small fires have led to complete loss of the aircraft and to death of passengers or crew because of inefficient ground aids.

Details are too lengthy to be produced here, but if "Enquirer" is interested he is referred in particular to the bulletins and reports issued by the National Fire Protection Association's Committee on Aviation and Airport Fire Protection, from 60 Batterymarch Street, Boston, Mass., U.S.A.

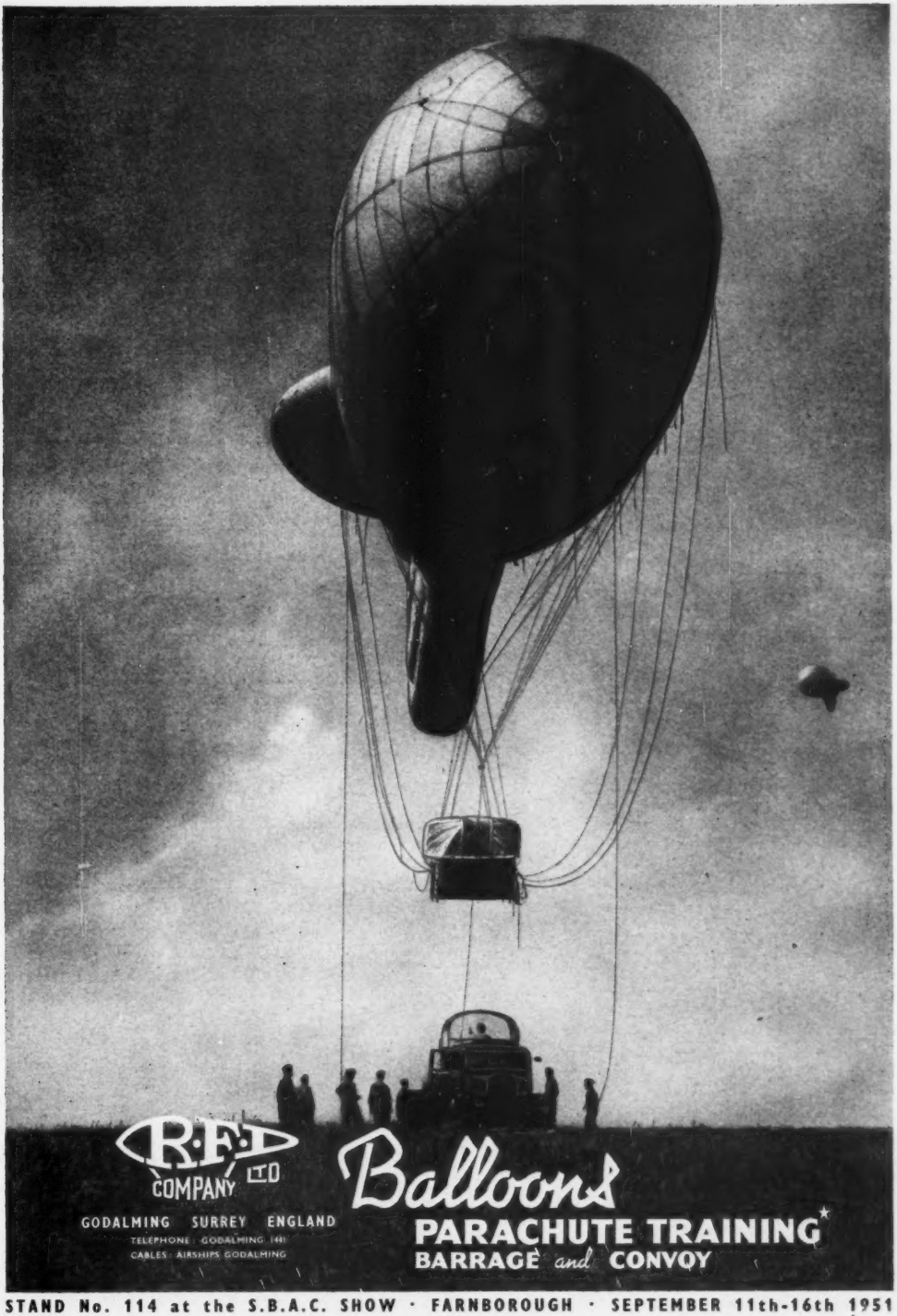
Recommended I.C.A.O. minimum crash/fire standards already exist for various grades of airfields, based on lengthy research by several organizations; but, with the above exceptions, most overseas airfields provide only from 5 to 40 per cent of the recommended outputs, and these cannot be successful on major fires.

London, W.11. FIRE ENGINEER.

I CANNOT answer your reader who enquires whether fire-fighting equipment has saved a single life at a civil airfield during the last 20 years, but I can mention one way in which it might be made more likely to do so in the future.

As "Enquirer" says, fire engines cannot normally travel beyond the perimeter. It ought to be compulsory, therefore, for all airfields except those reserved for gliders, to have bridges leading across the perimeter drainage ditches into adjoining fields; and every gate lying in the path of fire engines up to a distance of at least a mile from the perimeter ought to have laterally weak hinges and latches so that any vehicle that might be used in saving life can push the gates to the ground and drive over them.

Eastbourne. WILLIAM F. JORDAN.



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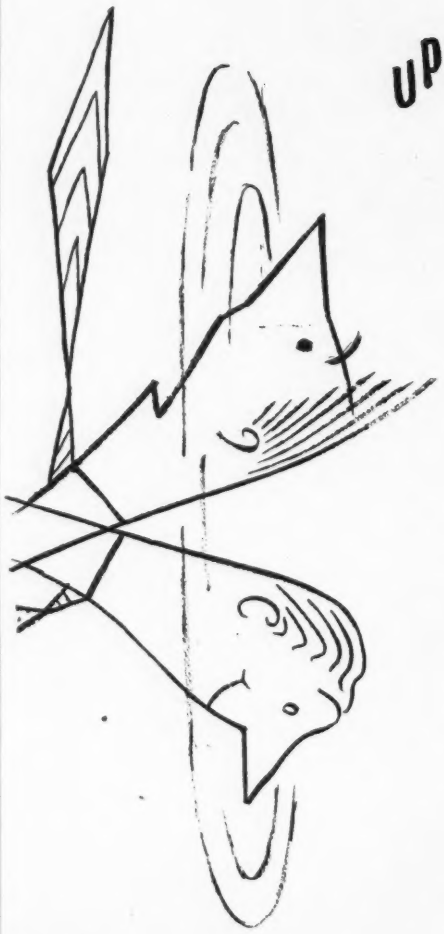

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SERVICE AVIATION

Royal Air Force and Naval Aviation News

HURRICANE PEEL-OFF for the film "Angels One Five", subject of recent letters in "Flight". First is tomorrow's London fly-past Leader; next, "Last of the Many"; the rest are Portuguese.

R.A.F. Appointments

UNTIL recently the Deputy Chief of Staff at Headquarters Allied Air Forces, Central Europe, A.V-M. W. A. D. Brook is to be A.O.C. No. 3 Group, Bomber Command.

A. Cdre. C. A. Stevens, with the acting rank of air vice-marshal, is to be S.A.S.O., Home Command, and A. Cdre. G. W. Tuttle, also with the acting rank of air vice-marshal, is the new Assistant Chief of the Air Staff (Operational Requirements) at the Air Ministry.

2nd T.A.F. Again

THE British Air Forces of Occupation, Germany, have been re-named the 2nd Tactical Air Force as from September 1st. Following the decision that the operational resources of B.A.F.O. should be placed at the disposal of the Supreme Commander, Allied Powers in Europe, the role of the command has become primarily that of a tactical air force. It was, therefore, considered appropriate to restore the historical name "2nd Tactical Air Force".

Now undergoing substantial expansion, the 2nd T.A.F. is placed temporarily under the command of A.V-M. Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C. On October 1st the post of C.-in-C. will be taken over by Air Marshal Sir Robert M. Foster, K.C.B., C.B.E., D.F.C., who is at present A.O.C-in-C. Home Command.

The 2nd Tactical Air Force, originally formed in June, 1943, as the result of experience gained with the 1st Tactical Air Force in Africa, was subsequently acknowledged to be one of the foremost fighting units of the British armed forces. From D-Day until the end of the war its squadrons flew 300,000 sorties and delivered more than 60,000 tons of bombs and rockets. It was then commanded by the late Air Marshal Sir Arthur Coningham.

Below: W/C. R. T. P. Davidson, D.F.C., commanding officer of No. 421 Fighter Squadron, R.C.A.F., now based at Odiham, is to be Chief Operations Officer of the new Canadian fighter wing forming in Britain this autumn.

Canadian Fighter Wing

THE headquarters of No. 1 R.C.A.F. Fighter Wing will be established at North Luffenham, Rutland, England, and commanded by G/C. E. B. Hale.

This wing will constitute part of the 11-squadron air division which Canada intends to establish in Europe by 1954. At first only one squadron will be at Luffenham, followed by two more shortly after Christmas. It is reported that all the units will be equipped with Canadian-built Sabres.

Command Change in Korea

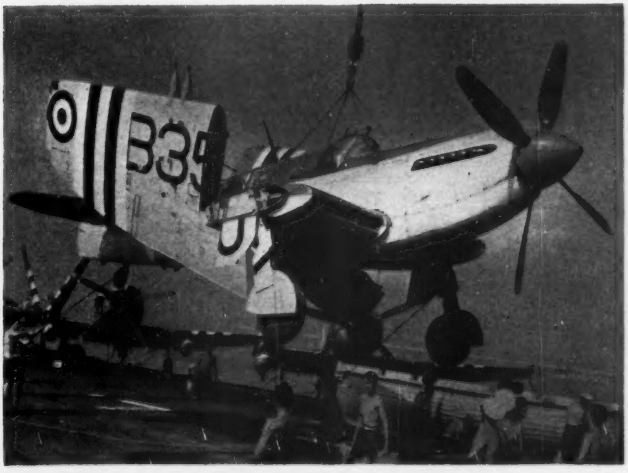
S/L. R. C. CRESSWELL has handed over the command of No. 77 R.A.A.F. Squadron in Korea to W/C. G. Steege, who has just returned from Britain after attending the Fighter Command convention.

In order to complete 300 combat sorties, S/L. Cresswell has transferred to an American squadron for a brief tour of duty. He will fly Sabres.

CF-100s for O.T.U.

CANADA'S new all-weather O.T.U., based at North Bay, Ontario, will be initially equipped with N.A. Mitchells and training versions of the Avro (Canada) CF-100 all-weather fighter. The unit will be commanded by W/C. W. M. Foster, D.F.C., a war-time fighter pilot.

Although this new unit will operate from North Bay, the airport will continue under



NAVAL LAMPYRIDÆ: A Fairey Firefly being embarked on the light fleet carrier H.M.S. "Glory" at Iwckuni in Japan for operations over North Korea.

WEATHER OR NOT: As reported in our previous issue, the Royal Naval flying display at Lee-on-Solent last Saturday week was marred by rain, though a number of events took place. Seen here are (below) Marine Commandos going aboard the Westland-Sikorsky S-55 helicopter, and (top) a Boulton Paul Sea Balliol T.21, as adopted by the Royal Navy for deck-landing and other forms of training.

SERVICE AVIATION . . .

the jurisdiction of the Department of Transport and its use by airlines will not be affected.

Carrier Flagships

WHEN H.M.S. *Vanguard*, Flagship of the Training Squadron since May, leaves for a refit Rear-Ad. R. M. Dick, C.B., C.B.E., D.S.C., will transfer his Flag to the carrier, H.M.S. *Indefatigable*. After a brief cruise in October the Squadron will be joined by H.M.S. *Implacable*.

H.M.S. *Indomitable*, the present Fleet Flagship of Admiral Sir Philip L. Vian, K.C.B., K.B.E., D.S.O., will remain in commission in the Home Fleet.

Naval Air Station Appointments

THE Admiralty has announced the following appointments: Captain W. J. M. Brown, O.B.E., D.S.C., as Captain-in-Charge R.N. Air Station Lee-on-Solent, and Captain A. S. Webb to St. Merryn, also in command.

Australian Command in Malaya

THE Australian Minister for Air, Mr. William McMahon, has announced that G/C. F. Headlam, the present C.O. of No. 90 (Composite) Wing of the R.A.A.F. in Malaya, will assume command of Tengah Airfield, Singapore, when G/C. R. C. Dawkins, R.A.F., returns to Britain.

G/C. Headlam will retain command of No. 90 Wing, which comprises a Lincoln bomber and a Dakota transport squadron.

ADEN OCCASION: His Excellency Mr. Tom Hickinbotham, C.M.G., C.I.E., O.B.E., inspecting the R.A.F. guard of honour on his arrival at Aden recently to take up his new appointment as Governor. He was welcomed by A.V-M. F. J. Fressanges, C.B., A.O.C. British Forces, Aden, who is seen in the background.

"Glory's" Part in Korean War

AFTER three months' duty in Korean waters since she relieved H.M.S. *Theseus*, the British light fleet carrier *Glory* (Captain K. S. Colquhoun, D.S.O., R.N.) has scarcely an aircraft in the 14th Carrier Air Group on board that has not been damaged by flak. This is accounted for by a stepping up of enemy anti-aircraft defence and the large number of sorties flown by the *Glory*.

The *Glory* is beating the records of H.M.S. *Theseus*. Lt. G. W. Bricker, R.N., having made the 3,000th deck landing of the commission. Some operations have been hampered by bad flying weather. During a tropical rainstorm, when visibility was reduced to 30 yards, several aircraft could not find their carrier until they had almost used up their petrol. One of them was flying for nearly four hours.

With their small navy wrecked in the first few days of war and their mercantile fleet crippled in twelve months of shelling and bombing of their ports, the North Koreans have been compelled to fall back upon junks and sampans to attempt to carry supplies by sea. Over 200 of these have been sunk or damaged by the *Glory's* aircraft alone. On land, attacks by land and carrier-based aircraft have repeatedly cut their railway lines, damaged and destroyed bridges and wrecked their trains. The enemy have been forced to use supply trains of mules, ox carts, and even camels.

While cease-fire talks have been going on the blockade has been drawn even tighter. More ships of the Allied fleets have been thrown into patrol of the enemy coast and bombardment of military installations. For the first time, the light carriers, H.M.S. *Glory* and U.S.S. *Sicily*, have worked alongside each other, using the same destroyer screen. They have pounded the enemy in spite of bad weather.

Other tasks of the *Glory* in addition to coastal reconnaissance as part of the blockade, are the destruction and interference with the enemy's supply lines bringing food and ammunition to his front. The enemy's ability to by-pass areas damaged at night has necessitated a constant reconnaissance and attack. His ingenuity in camouflage has brought out an equal skill in pilots in spotting it.

Charity Baseball Match

AT the White City, London, on Saturday, September 22nd, the United States Air Force will play a baseball match against a combined R.A.F. and R.C.A.F. team. Tickets range from 2s to 5s and the proceeds will go to the Soldiers', Sailors' and Airmen's Families' Association.

Reunions

THE Education Branch of the R.A.F. is holding its fifth annual dinner in London on Friday, November 2nd. Tickets (one guinea) may be had from the Dinner Secretary, R.A.F. Education Branch, Room 325, Adastral House, Kingsway, London, W.C.2.

No. 617 Squadron will hold its first reunion dinner in London on Friday, October 19th. Particulars from S/L. H. B. Martin, c/o F/L. Hobday, 26, The Glade, Stoneleigh, Epsom.

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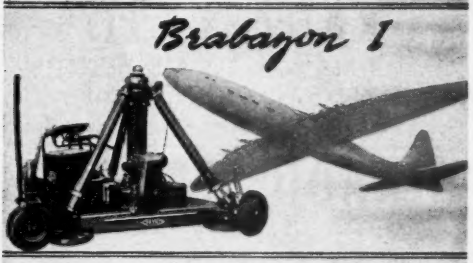

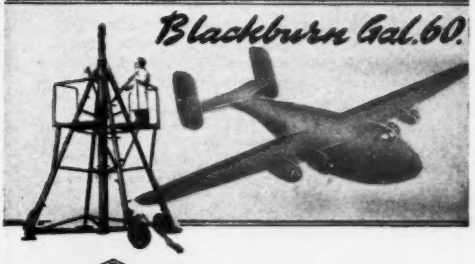

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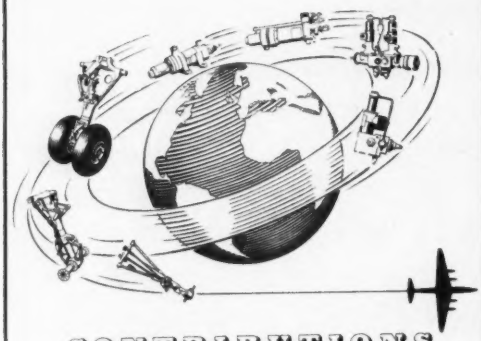

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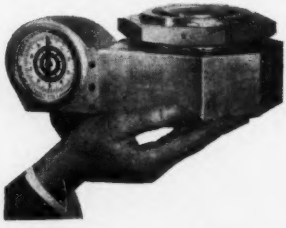

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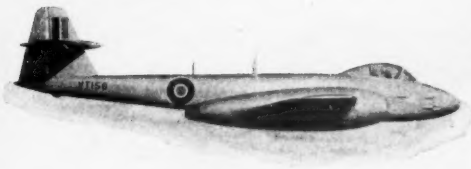

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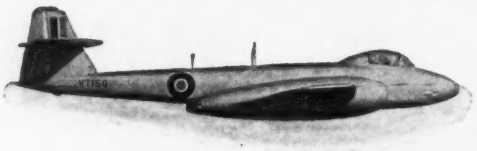

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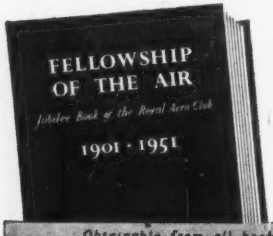

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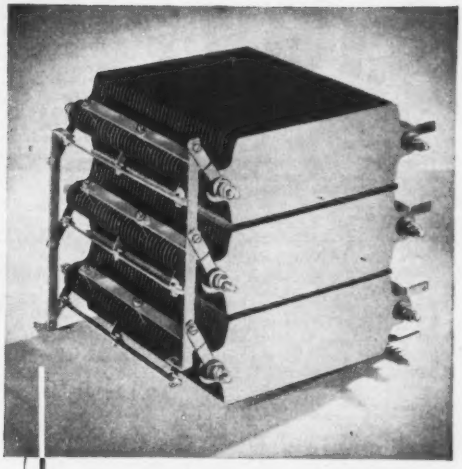

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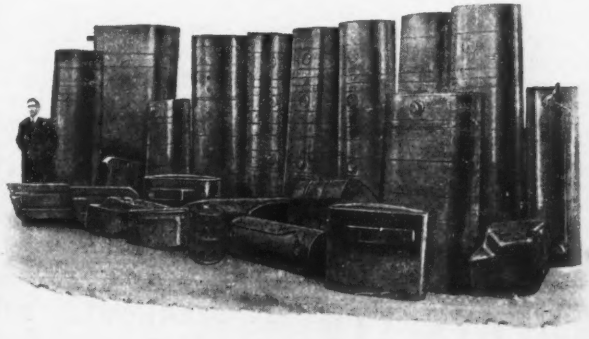

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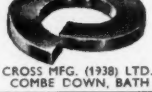
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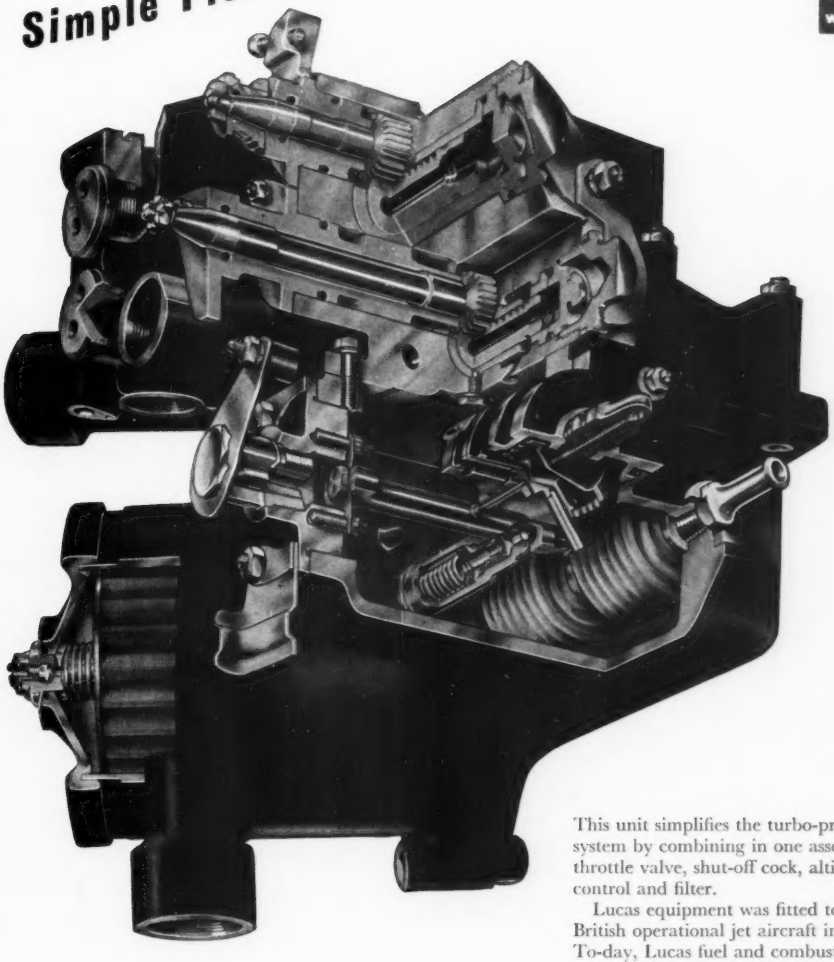

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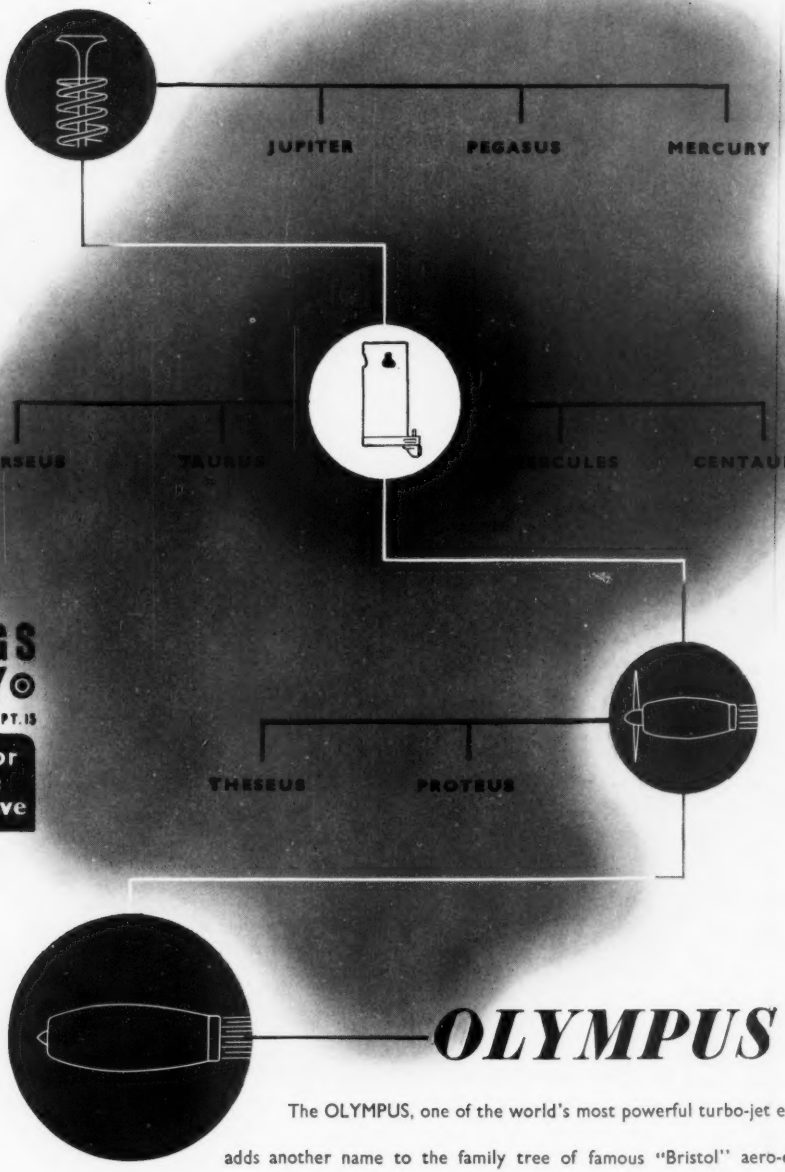

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